THURSDAY, JANUARY 17, 1884

FAMILY RECORDS

Record of Family Faculties. By Francis Galton, F.R.S. (London: Macmillan and Co., 1884.)

Life-History Album. By Francis Galton, F.R.S. (London: Macmillan and Co., 1884.)

MR. GALTON is indefatigable in his zeal to promote the cause of eugenics. His most recent efforts in this direction have resulted in the publication of two quarto books, which respectively bear the titles above given, and which betoken no small amount of labour on the part of their author. Feeling the importance of casting a wide net for the capture of facts bearing on the science of eugenics which he hopes to inaugurate, Mr. Galton has here presented to the public a formidable array of blank forms or tables, to be filled up by any one who may have caught a spark of his own enthusiasm in the new cause. And not only so, but, to stimulate the energies of a blind and foolish generation, he has offered rewards or prizes to the extent of 500*l.* for the best writing up of the Records of Family Faculties. Lest any of our readers, however, should be induced from sordid motives alone to invest a few shillings in the purchase of this curious book, we think it is desirable to warn them at the outset that if they intend to write for one of the prizes they must know a good deal more about their family history than was known even by the writer of the book, which begins—"This is the book of the generations of Adam." For, as far as it appears from his preface, Mr. Galton would not award even the least of all his prizes to any one who could prove direct descent from Adam; nay, it would be useless to prove such descent even from any particular gorilla. For, we are expressly told, "no countenance is given to the vanity that prompts most family historians to trace their pedigree to some notable ancestor. . . . We should remember the insignificance of any single ancestor in a remote degree. . . . One ancestor who lived at the time of the Norman Conquest, twenty-four generations back, contributes (on the supposition of no intermarriage of kinsfolk) less than one part in 16,000,000 to the constitution of a man of the present day."

What Mr. Galton wants, therefore, is not the record of a long pedigree, but an accurate and detailed account of a short one. And this is just what makes his tables so difficult to fill up. We must not only know all about our father and mother and grandfathers and grandmothers, but also about our father's father's father, father's father's mother, father's mother's father, father's mother's mother, mother's father's father, mother's father's mother, mother's mother's father, and mother's mother's mother. Even this, indeed, is not enough to satisfy Mr. Galton; for, "besides the direct ancestors, the brothers and sisters of each of them have also to be taken into account," and are accordingly all provided for in the blank tables. Obviously not many of us could answer any of the following questions touching, say, a mother's father's mother's brother:—Date and place of birth, occupation, residences, age at marriage, ditto of spouse, number and ages of sons and daughters, mode of life, height, colour of hair and eyes, general appearance, degree of strength, perfection or imperfection of special senses, mental powers, personal character, favourite pursuits, artistic aptitudes, minor ailments, graver illnesses, cause and date of death, and age at death.

The impossibility, however, of any one competitor filling up all the tables is of course no argument against setting the questions. The same questions are submitted to all the competitors, and those who can answer most or best will receive the 500*l.* Perhaps a few years hence, when Mr. Henry George shall have effected his social revolution in this country, our aristocratic families (who are favourably handicapped in their knowledge of ancestry) will be thankful to assist the science of eugenics upon the terms now offered by Mr. Galton.

The "Life-History Album" is, in size, date, and general appearance, a companion to the "Record of Family Faculties." It runs to 72 pages, which are arranged for entries in five-yearly periods from birth to 75 years of age. We can imagine the melancholy aspect of a man who in the year 1959 sits down to fill up the last page of a copy of this album, the first page of which is now being begun by his parents. What a retrospect will lie before his dim and saddened gaze! Every tooth that he gained in childhood, and every tooth that he lost in age has been duly chronicled; all the fluctuations in his weight, health, and strength are recorded; he can trace the dawn and rise of all his bodily and mental powers from infancy to manhood, and can measure with the most painful nicety their continuous decline from manhood to old age. He has before him a little picture gallery of fifteen photographs taken at five-yearly periods, to impress upon him with yet more cruel vividness what a wreck he has become; and now there is no further page whereon to continue the record so long and so faithfully kept. Even the interest of Mr. Galton in all that he was to be and all that he was to do has come to an end; he has literally turned over the last page of his life, and if his poor old eyes do not drop a tear upon the closing tragedy, it can only be because his zeal for science has devoured every other emotion.

But although this aspect of the matter is irresistibly suggested by the close of the album at 75 years of age, without even the provision of a blank page for any further possibilities (with trembling fingers these might, indeed, be pasted in), we must remember that the evil here lies in the fact of mortality. So long as a man is alive, it may be useful to him in many ways—apart from eugenics—to have such a physical record of his life thus kept from his earliest days. No doubt the sooner it is begun the more value it will subsequently have; but Mr. Galton virtually tells us that, as in the Pilgrim's Progress, so in the pilgrimage of life, "better late than never" in making a beginning.

In order to show some of the personal, as distinguished from any scientific, advantages which may reasonably be expected to arise from keeping such a biological history of one's self, we shall conclude by quoting an extract from Mr. Galton's own exhortation.

"*To the Owner of this Book*

"1. It will show whether, and in what way, your health is affected by the changes that take place in your residence, occupation, diet, or habits.

"2. It will afford early indication of any departure from health, and will thus draw attention to conditions which, if neglected, may lead to permanent disorder. Without such a record, the early signs of disease, which are commonly slight and gradual, are very likely to pass unrecognised, and thus the opportunity will be lost of seeking advice at the time when preventive or curative measures can be most successfully taken.

"3. A trustworthy record of past illnesses will enable your medical attendants to treat you more intelligently and successfully than they otherwise could, for it will give them a more complete knowledge of your 'constitution' than could be obtained in any other way. This knowledge is so important that life itself may in many illnesses depend upon it.

"4. The record will further be of great value to your family and descendants; for mental and physical characteristics, as well as liabilities to disease, are all transmitted more or less by parents to their children, and are shared by members of the same family. 'The world is beginning to perceive that the life of each individual is in some real sense a prolongation of those of his ancestry. His character, his vigour, and his disease, are principally theirs. . . . The life-histories of our relatives are, therefore, more instructive to us than those of strangers; they are especially able to forewarn and to encourage us, for they are prophetic of our own futures.'—(*Fortnightly Review*, January, 1882, p. 31)."

We have now said enough to show the general character of these original publications. We ought to add, however, that they may be purchased separately, and therefore, notwithstanding the prizes offered for the best Records of Family Faculties, we think it probable that the "Life-History Albums" will have the better sale. They are inexpensive to buy, and, apart from the trouble of writing them up at intervals, require for their keeping no other kind of expenditure. GEORGE J. ROMANES

SIAM

Temples and Elephants: The Narrative of a Journey through Upper Siam and Lao. By Carl Bock. (London: Sampson Low, Marston, and Co., 1884.)

THE expedition undertaken by Mr. Bock in 1881–82 to the Indo-Chinese mainland was practically a continuation of his previous ramblings in the Eastern Archipelago, a graphic account of which he has given us in his "Head-Hunters of Borneo." Of both the main object appears to have been rather archæological and ethnographical than strictly scientific, and of both the incidents and results have also been somewhat analogous. In each case some hitherto unvisited tracts were explored, or at least traversed, each was marked by a striking absence of any stirring adventures "by flood or field," both yielded, besides some additions to our geographical and ethnological knowledge of the regions in question, a considerable amount of "curios and treasure-trove"; but the quest of the "tailed people" proved as bootless in Further India as it had in Borneo.

In other respects "Temples and Elephants," although far less profusely illustrated, compares not unfavourably with "The Head-Hunters." It is uniformly written in surprisingly good English, and it gives us for the first time a tolerably clear account of the region of the water-parting between the head waters of the Menam and the Middle Mekong basins, and indeed of the whole course of the Menam almost from its source to the Gulf of Siam. The source itself was not actually reached, but it was ascertained with some certainty to lie altogether within Lao territory, or about 20° N., 99° E., and not further north in the Shan States, as shown on all recent maps, even that accompanying vol. viii. of Reclus' "Géographie Universelle." By taking boat at the now ruined city of Fang, and sailing down the Me-Fang and Me-Kok, the Mekong was reached just below Kiang-sen, where, a thousand miles from its mouth, it was found to be still a magnificent stream "twice as wide as the Menam at Bangkok." This was the furthest point reached, and on the return route the narrow but rugged water-parting was crossed by a pass 2000 feet high leading down to the Meping, as the Upper Menam is here called Henceforth the rest of the journey was made entirely by water, proving that for small craft the Menam is navigable almost from its source to its mouth. Even the dangerous rapids near Mutka, above the Lao and Siamese frontier, were successfully run by the ingeniously constructed boats specially adapted for navigating this section of the great Siamese artery.

All the chief towns in this basin were visited, and a very full account is given of such important but almost unknown places, as Raheng (Rahein), Lakhon, Lampoon (Labong), Cheng-mai (Kiang-mai), Muang-Pau (Prau), and Kiang-hai), all except Raheng lying within the western Lao domain. Raheng, the northernmost town in Siam proper, appears to be the centre of a very considerable trade with the surrounding lands, and some strong arguments are urged in favour of the projected railway between that place and the capital. Such a line would present no engineering difficulties, running as it would through an almost perfectly level country; it might be cheaply constructed by Chinese coolie labour, available on the spot; it would run through the most densely peopled districts in Siam, and would at once open up a vastly productive region, whose almost boundless resources are now lying waste.

"The agricultural resources of the district of which it [Raheng] is the centre and natural outlet are extremely rich. Its timber alone is sufficient to insure prosperity: but it has further sources of wealth in the varied indigenous products of the country, and still more in the entirely undeveloped resources of its fertile soil. All that it wants is a railway to carry the products of the country at all seasons and without delay to the markets of the world, and to enable it to receive the large imports which an increasing population would at once necessitate" (p. 137).

But most readers will probably turn most eagerly to the chapters devoted to the habits and customs of the Karians (Karens), Mussus (Mossos), Ngiou (Shans), and especially of the Laosians (Laotians, Laos), whose political and social institutions, domestic life, religion, arts, and daily pursuits are here very fully described. The remarks on all these subjects will be found both interesting and valuable to the ethnologist, because mainly the result of personal studies made on the spot by a shrewd and experienced observer. Mr. Bock speaks of the Laos as of a finer type, fairer, and better-looking not only than the Malays but even than the kindred and more civilised Siamese. They are described as of superior physique, lighter complexion, with good, high foreheads, more

regular features, and nostrils not so dilated as those of their neighbours. A curious peculiarity is the power of bending the elbow the wrong way, and similarly distorting the wrist joint, so that the hand can be bent over till the back of it touches the arm. This, however, does not appear to be the result of any special conformation of the joints, but rather of a long and severe course of training, in which "force is often resorted to in order to distort nature's handiwork" (p. 321). It will be remembered that one of the distinctive features of Krao, the little specimen brought from Bangkok by Mr. Bock, was a remarkable pliancy of the joints, extending even to the toes, which were almost as prehensile as those of the higher apes.

Amongst the illustrations is a curious design by a native artist (unfortunately "invested with artistic merit" by the English engraver) representing a scheme of the universe, with Mount Zinnalo, the Meru of the Hindus, as the centre. Above all is the outer darkness, or Buddhist *Nirvana*, usually supposed to involve extinction, or at least absorption in the divine essence, but which our author agrees with Mr. Alabaster in identifying rather with the highest heaven, a place of perfect happiness or repose. But however this be it is obvious that the Laotian Buddhism has been otherwise profoundly modified by the older cult, on which it has been engrafted, and from which it still takes its colouring. This older cult was little more than a universal spirit-worship, probably the first distinct stage in the evolution of all religious systems. Hence "the desire to propitiate the good spirits and to exorcise the bad ones is the prevailing influence on the life of a Laosian. With 'phees' to right of him, to left of him, in front of him, behind him, all round him, his mind is haunted with a perpetual desire to make terms with them, and to insure the assistance of the great Buddha, so that he may preserve both body and soul from the hands of the spirits, and, by making merit either in almsgiving, in feeding the priests, in building temples or prachedees, he may ultimately attain supreme happiness" (p. 198). At Muang-Fang the people are shown a telescope, whereupon they immediately ask, "Can you see the spirits through it?" And when it is reversed so that everything seems to fade away in the distance, they are hugely delighted at such a wonderful instrument, which has the power of making all things—spirits of course included—near or far off at the will of the owner!

Then these spirits, some of which, such as the phee-ka, are very baneful, require to be thwarted by all sorts of counter-charms, conjurings, exorcisms, spirit-dancings, and other devices of the professional medicine-men, and even of "paid mediums." For this institution—somewhat of an anachronism in the West—still flourishes in the Far East, where almost every family has its private mediums, who are consulted on all urgent affairs, and who, when required to question the spirits, work themselves into a state of ecstasy, and utter short, incoherent sentences, regarded as the oracles of the spirit world.

Amongst the illustrations are a coloured engraving by the author, giving a good idea of the "white elephant" visited by him at Bangkok, and a life-size portrait of the enlightened young King of Siam, to whom the work is dedicated. There are also an index and a small sketch-map of the route followed, in which the geographical nomenclature is, as usual, at variance with that of the text. Thus we have Kiang-mai, Toune, Me-ouring, Chandaw, for Cheng-mai, Tunn, Me-wang, and Shandau respectively.

A. H. KEANE

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

The Remarkable Sunsets

ALTHOUGH the prevailing mist and fog do not make the summit of Ben Nevis as a rule a favourable situation for viewing sunsets, yet, when clear and fine, the colours of the sky shine out with far greater clearness and purity than at lower levels. For about a week at the end of last month we had fine weather, and the colours of the sky before sunrise, after sunset, and even during the day, were of the most extraordinary character.

On December 30 before sunrise the lower sky to eastward, between a cloud-bank and a thin dark band of stratus, was pale green, above the stratus it was yellow, passing into red higher up. This arrangement of colour was not observed again; on other days the sky was red or yellow at the horizon, passing into green and blue higher up. At sunset on the 30th the colours were of the most gorgeous description—dark smoky red below, passing into blue and violet without any intermediate shade of green.

Similar colours have no doubt been seen as well at lower levels at sunrise and sunset, but here we see the sky round the horizon coloured in the most wonderful manner all day long—usually a copper red under the sun, and a peculiar dirty green at the opposite azimuth. But it is impossible to give any idea of the exceeding beauty and weirdness of the tints at sunrise and sunset—the whole sky near the sun gleaming with constantly changing masses of colour, indescribable tints of red and green mingled in wild confusion.

On December 31 the thin edge of the crescent moon (three days old) was bright green, but I have not observed any unusual colour in the sun itself.

R. T. OMOND

Ben Nevis Observatory, January 9

I BEG your acceptance of the two inclosed clippings from the *Saturday Press* of this city, together with an advance sheet from Thrum's *Hawaiian Annual* for 1884, which contain nearly all that has been put into print here about the wonderful "afterglow" which has excited such attention in so many parts of the globe. In the first communication of September 19, I recorded the important date of September 5, when the first and most brilliant display was observed, being moved thereto by the arrival of the news of the Java eruption, whose proximity in time seemed to lend especial importance to the phenomenon. In the second notice is recorded an observation of like phenomena in lat. 24° 06′ N., long. 140° 29′ W., 1100 miles east-northeast of us, from the log of the bark *Hope*, Penhallow, master, on September 18.

In my article in the *Hawaiian Annual*, the record is brought down to November 25, during which month the glow continued, somewhat diminished. Since then it has again increased in a marked degree. I have also been enabled to definitely connect ourselves with Melanesia and Micronesia. Brig *Hazard*, Tierney, master, arrived from those parts on December 5. Capt. Tierney is reliable and intelligent. He reports to me that on September 1, when off the south-west coast of New Ireland, about lat. 5° S., long. 152° E., he first observed the "glare," as he termed it; and again on September 3 off New Hanover, two degrees further west. It was identical in character with what he has seen since arriving in Honolulu. It would seem to have been rather less brilliant than was first observed here September 5, as described in the inclosed clipping. During his voyage from New Hanover, sighting Ascension, calling at the Marshall Islands, and thence to Honolulu,

over ninety days in all, the "glare" was of *constant occurrence*. By the arrival of O.S.S. *Mariposa* from San Francisco, December 1 to 8, I am happily able also to trace a continuous line of these phenomena hence to that point. They were not observed there until about November 23. Two of our leading citizens who came down by the *Mariposa* assure me that the appearances there were identical with ours, and further that they were of frequent recurrence during the whole passage. We thus prove a continuous chain of these phenomena from New Zealand to California.

Permit me to call special attention to the very peculiar corona or halo extending from 20° to 30° from the sun, which has been visible every day with us, and all day, of whitish haze, with *pinkish* tint, shading off into *lilac* or purple against the blue. I have seen no notice of this corona observed elsewhere. It is hardly a conspicuous object.

The long continuance and extending diffusion of this haze or dry fog seems to justify expectation that it may become visible around the globe, and give ample opportunity for investigation.

Although not seen in San Francisco until November 23, it was brilliant in Santa Barbara on October 14. A rapid upper current seems to have borne it in a belt within the tropics in a very few days, leaving a slow diffusion to extend it to the temperate zone. Australia is perhaps an example of this.

I trust this letter may be a useful contribution towards a complete history of the diffusion of this very peculiar element around the globe. A good record of dates of earliest appearances might contribute something to our limited knowledge of currents in upper strata of the atmosphere.

Honolulu, December 14, 1883 SERENO E. BISHOP

[We have already referred to Mr. Bishop's letters in the Honolulu journal, but give here the following extract from his article in the *Hawaiian Annual*:—

"It now seems probable that the enormous projections of gaseous and other matter from Krakatoa have been borne by the upper currents and diffused throughout a belt of half the earth's circumference, and not improbably, as careful observation may yet establish, even entirely around the globe. This implies an amount of matter discharged that seems incredible. We learn, however, that the ocean was thickly and closely covered with floating pumice for hundreds of miles from the crater. A steamer 150 miles distant reports her barometer falling and rising half an inch every two or three minutes! This almost incredible statement implies a terrific undulation of the atmosphere, such as could only be produced by a vast and continuous jet of gas projected upwards beyond the limits of the atmosphere, and driving the air in vast waves in every direction. So abnormal and gigantic a force may well have propagated not only its tidal waves as it did across the Pacific, but it may also have transmitted its portentous and lurid vapours to belt the globe with flaming skies."]

FOR the last two months these appearances have in this province excited no small wonder and admiration, not unaccompanied in some cases with awe and dismal forebodings of impending calamity. As an example of what has been witnessed in greater or less intensity almost every morning and evening, about an hour before sunrise and after sunset, I may instance what was observed on the evening of the 29th and morning of the 30th ult. The ground from my residence rises towards the south and west, and the city of Fredericton lies towards the north-east, on a flat 100 feet lower, and at a distance of half a mile or more. On the evening in question, at an hour after sunset, the red glow in the sky was very conspicuous, and seemed to light up the whole heavens, so that the houses in the city were distinctly seen by the reflection from their sides, and the intervening snow appeared of an orange colour. It was bright enough to suggest the impression of a second sunset. Next morning at an hour before sunrise the deep red glow was equally decided. W. BRYDONE-JACK

Fredericton, New Brunswick, January 3

IN response to your note in NATURE of December 13, 1883 (p. 157), I beg to inform you that the recent red sunsets have been especially observed by me on the following occasions:—

November 30, 1883, lasting until 5.30 p.m.; barometer at 1 o'clock 30·22 inches, at 9 p.m. 30·10.

January 2, 1884, lasting until 7.30 p.m.; barometer at 1 p.m. 30·48, at 9 p.m. 30·43.

January 3, 1884; Barometer at 1 p.m. 30·30, at 9 p.m. 30·23.

On several other occasions the same phenomenon has been observed in a less degree. AD. WENTZ'L, JUN.

Krasnicza Wola, Grodzisk, near Warsaw, January 11

THE "red glow" has again been very brilliant here on the evenings of January 9 and 10, as well as on the morning of January 10. On the following morning, January 11, the sky being likewise very clear, I confidently expected another display, but to my astonishment no trace of red did appear, the sun rising after an ordinary twilight of pale yellow. During the night a strong south wind had set in, which prevailed through the whole day, with extraordinary transparency of the air. In the evening clouds arose in the west, at first showing the red marginal colouring of ordinary sunsets, but later on there came again, distinctly higher than even the cirri, a very brilliant and lasting red luminosity.

It would be interesting to know whether at other places too the phenomena in question had been, as it were, suspended on the morning of January 11, in spite of a clear sky, or whether such a suspension had occurred on other days under similar meteorological circumstances. D. WETTERHAN

Freiburg, Badenia, January 12

THE last two days and nights here have been very fine with sunrises and sunsets as already described. This evening especially the colours were most brilliant, and did not fade away until at least an hour after sunset. It may interest those who are trying to account for this extraordinary appearance of the sky to know that here it has been followed by excessive rain and very bad weather. During December we had 9·57 against an average for the last twenty-two years of 4·46 inches. The greatest December rainfall registered at our Scutari Cemetery was 10·36 in 1862, the least being one inch in 1868. A printer's error makes me speak, in my letter of December 21, of a crescent moon "eighteen" days instead of 1·8 day old. W. E. J.

Constantinople, January 11

Dust Atmosphere of China

IN the remarkable work on China by V. Richtofen, he gives (vol. i. p. 97) the following description of the *dust atmosphere* of the Loes country, China, which, it seems to me, bears upon the question of the influence of dust on the appearance of the sun and sky, the question now under discussion.

"All these, and other similar operating causes, give rise to that dust atmosphere (*Staubatmosphäre*) so characteristic of Central Asia, and still more particularly of the Loes District. Even during nearly complete calms the air is often for many days yellow and opaque. The view is completely hemmed in, and the sun appears merely as a dull bluish disk. More markedly is this character presented by these peculiar dust-storms so well known to travellers visiting Tien-tsin and Peking, and even more so to those who travel in the interior of the north-western provinces of China. The wind then blows from Central Asia; when it acquires motion, everything becomes coated with a fine, yellowish dust coating.

"In Shensi, where the atmosphere is but rarely clear and transparent, the whole landscape has a yellow tint; streets, houses, trees and crops, even the traveller one meets on the road, and the air itself, one and all are yellow-coloured."

He also cites Johnson's "Journey to Ilchi, the Capital of Kotan" (*R. Geogr. Soc.* xxxvii. 1867, p. 5), as bearing on this same character of those dry, dusty atmospheres.

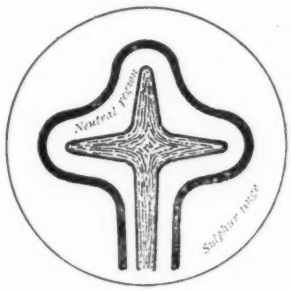
Dublin, January 7 J. P. O'REILLY

Electric Shadows

ON reading Prof. Thompson's communication to NATURE of the 13th ult. (p. 156), giving the result of Prof. Righi's researches on the production of electric shadows in air at the ordinary pressure, I at once endeavoured to repeat the experiments with such simple means as were at hand. Two sticks of sealing-wax stuck to a small iron stand sufficed to support a long, big headed pin and the screen or object for casting the shadows. Instead of a plate of ebonite I used a cake of resin of six inches diameter, which serves ordinarily for the production of Lichtenberg's

figures; and from subsequent experiments it would seem that the resin serves the purpose *almost* as well as ebonite as far as clearness of definition is concerned. A metal plate, which may or may not be insulated, formed a base for the resin. I mention these details since the ebonite rods and plate are not so well within every one's reach, on the score of greater expense and the necessity of having them specially constructed for the experiments. A plate machine of some size (18-inch plate) seems necessary, as I find that, unless the Leyden jar is charged to rather high potential, no shadow is formed, and, further, that the sharp definition of the shadows increases with the charge of the jar. The screen used was a design, cut out in cardboard and tinfoil pasted over it, very similar in shape to that given in Fig. 2 in Prof. Thompson's paper, and the shadows obtained were substantially similar to that in Fig. 3. But here a small point not before recorded came out:—If the pin, from whose point the discharge is made to take place, be slanted in any direction, which is easily done with the sealing-wax holder by simply heating, the shadow of the object then lengthens out curiously, just as do the shadows formed by an object intercepting light rays as the obliquity of incidence is increased.

The new feature, however, which appeared from my experiments, and which is not recorded by Prof. Thompson, although very likely the experiment may have been done before, is as follows:—Instead of starting with the resin plate in a neutral condition, I gave it a rather strong negative charge by rubbing it vigorously with a fox's brush and discharging the Leyden jar as before on to the pin, using precisely the same object to cast the shadow as before. Its character now, however, was completely altered, appearing as I have endeavoured to represent it in the figure. A simple cross, having little resemblance as to outline



with the object, was the result. The red-lead of course was picked out by the negatively-charged resin under the object and piled up to form the cross, which was much more strongly red, as one would expect, than the former shadow. There was also a rather wide neutral region around the cross, considerably more than in the former experiments. It seems to me that this effect is something more than the attenuation of the shadow spoken of by Prof. Thompson, where the screen is electrified independently. Since the subject is one of considerable interest, perhaps it may be useful to show that any one having access to a fairly good electrical machine can repeat and possibly extend Prof. Righi's investigations.

W. F. SMITH

17, Colville Mansions, W.

Cosmic Dust

I FOUND in the *Nieuws van den Dag* of December 28, 1883, that a violet sand had been found in the dunes (probably near Scheveningen). The paragraph runs as follows:—When seen under the microscope (feeble magnifying) the ordinary yellow sand seemed to be composed for the greater part of almost white transparent grains, among which were a few light yellow, and pink, and single black grains. The violet sand, however, showed almost all the grains imbibed by a light violet tint, and moreover it contained a very great number of black glittering grains. An idea which occurred to me made me take up a small magnet, and on stirring with it in a glass full of the sand, the ends were covered by feathers formed by the black grains quite the same as the feathers which are formed on putting a magnet into filed dust. Probably I had there grains of a combination of iron; of the latter there was a great deal in it. Now this is the question: Are these grains of the same kind as those which the naturalists have found and gathered on the snow-fields in the Polar regions, thus called cosmic dust?

Stuttgart, January E. METZGER

Diffusion of Scientific Memoirs

I THINK it would promote scientific information if it were more the custom for those who need copies of papers to make direct application for them. Authors are usually provided with separate impressions for distribution, but are often much in the dark as to how to turn them to the best advantage. The bulk of such copies usually find their way to men of established scientific position who have worked at the subject of the paper in past years, but have perhaps ceased to take interest in it; while those who are actively engaged upon the subject, if they do not happen to have already published matter of importance, are left unprovided for.

I believe that most authors would willingly send copies of their memoirs to younger men, known to be engaged in scientific work, who should make application. But there is one rule which must be observed with the utmost stringency—otherwise I should feel that the evil of the present suggestion outweighs the good—viz. *the applicant must never expect a written answer.*

Cambridge R.

Weather on Ben Nevis and Snowdon

I WAS much interested with the account of a visit paid to the Ben Nevis Observatory on December 26, 1883, described in NATURE of January 3 (p. 219), more particularly as the weather experienced on the summit was almost identical with that on Snowdon at the same time. I ascended Snowdon on December 23, 25, and 26 from the west, east, and north, and a neighbouring mountain, Glyder Fach, on the 24th. The views from the summit on the 25th and 26th can be best described by the following quotation from NATURE (p. 219), referring to Ben Nevis:—"The view from the summit was magnificent. All round there floated a billowy ocean of white mist" (extending from the slopes of the mountain to the horizon north, south, east, and west), "through which rose here and there black mountain peaks." "Overhead the sky was blue," and the sun shone brilliantly. The upper surface of the ocean of clouds was on the 25th about 2000 feet, and on the 26th 1000 feet, above sea-level.

On the 24th I ascended Glyder Fach through about 2500 feet of mist, and, to again quote from NATURE (p. 219), on reaching the ridge "suddenly emerged from the gloom of the mist into the brightest of daylight. Overhead the sky was blue, a fresh light breeze was blowing" from the north-west. I here noticed a curious phenomenon. I became suddenly aware, whilst standing in the sunlight on the ridge, that the air was full of an exceedingly minute dust driven by the wind from the north-west and descending at an angle of about 40°. The fall ceased quite suddenly one or two minutes after I noticed it. The impression left on my mind was that anything popularly spoken of as dust would be exceedingly coarse compared with it. There was no snow on the ground.

The phenomenon known under the name of the "Brocken Spectre," mentioned by Mr. Chrystal, may frequently be seen from the summit of Snowdon by any one not afraid of a little mist.

T. SINGTON

Kersal Moor, Manchester, January 7

Teaching Animals to Converse

J. S. B. seems to have misunderstood Sir John Lubbock's idea. It would be no great test if drawings were made, as the dog would see so little difference. Thus a dog of mine knows instantly whether he may go out with my housekeeper or not according to whether she wears her hat or her bonnet. In the first instance he knows she is going where he may go, and he is on his feet barking with joy as soon as she appears. If she has the bonnet on, he knows it to be church, or a visit to friends in the country, where he cannot go, and, like the "eldest oyster" (I quote from memory), he "winks his eye, and shakes his hoary head." If drawings of hat and bonnet were made, he would know them at once.

Some years since I had a remarkably clever Skye terrier, whose wisdom was at the time shown in a letter to the *Times*. This dog I taught as follows. When I went out it was quite sufficient to say "Yes" or "No" in an ordinary tone; but wanting to take him beyond that, I taught him very quickly to

know the two words when printed on cards, YES or NO, and after a few weeks' teaching he never mistook them. I have no time now for much teaching; if I had, I am sure it could be done with the dog I now have. The intelligence of cats is greatly underrated. My wife's favourite cat follows her everywhere, and comes when called wherever she may be. Cats, too, are very grateful for kindness. When I went into the Malakhoff I found a cat on whose paw a bayonet had fallen and pinned it to the ground. I released it and took it home, and it always followed me all over the camp till the end of the war. And this cat did as follows. I took her to a doctor of the nearest regiment for two mornings to have her foot dressed. The third morning I was away on duty before daylight, and the cat went herself to the doctor's tent, scratched the canvas to be let in, and then held up her paw to be doctored. The intelligence that can be developed in almost any animal depends in most cases on our treatment of it.

H. STUART WORTLEY

South Kensington Museum, S.W., January 14

Circling to the Left in a Mist

ONE generally reads that persons walking without landmarks perform a large circle and cut their old tracks again. This circling, as far as my present knowledge goes, is *to the left*.

My present theory is that in most persons the right leg is the stronger and the more forward to step over any obstacles, and hence that it slightly outwalks the left; this theory involving as further consequences that those in whom the left leg is the stronger would circle to the right, while those whose legs are of equal strength would either keep straight on or would wander either way indifferently. I imagine this "outwalking" of one leg by the other to be similar to the manner in which a body of troops wheels to one side or the other.

In the following I use the expression "*right-legged*." By this I mean that the right leg is that chosen to kick with, jump from, &c.

My negative evidence is as follows:—

1. I myself am right-legged, and in a mist I always circle to the left. I have only come across cases similar to my own in these respects. On the other hand, my left arm has been trained (by always rowing on the bow-side) to be stronger than my right for rowing purposes; and in sculling I always circle to my right side.

2. Those savages of whom I have read that they could keep a straight course without any landmark were also represented as using both arms (and legs?) impartially.

I have given the above evidence chiefly to show how weak it is, in the hope that some of your readers will try to collect data of the following nature from any of their acquaintance who have had experience in the matter:—

(*a*) To which side, if any, do they circle?

(*b*) Are they right- or left-armed, right- or left-legged? or are the two sides equally strong?

It might also be interesting to learn from boating friends if they have observed any connection between the side on which they have been accustomed to row and the side to which they circle in sculling; such connection as that indicated above.

Finally, I may suggest that more might be known on the question of the heredity of right- or left-sidedness; and as to whether persons are often right-armed but left-legged, &c. But it must be remembered that tendencies of this nature are often "educated out" in childhood.

W. LARDEN

Cheltenham College

THE PORPITIDÆ AND VELELLIDÆ

PROFESSOR ALEXANDER AGASSIZ has quite recently (July) published an important contribution to our knowledge of the morphology and embryology of these families of marine Hydrozoa. This appears as one of the quarto memoirs of the Museum of Comparative Zoology at Harvard College, and is illustrated with twelve plates. While at the Tortugas, during March and April, 1881, examining the structure of the coral reefs, Prof. A. Agassiz took advantage of every possible opportunity of exploring the surface fauna of the Gulf Stream, and when not otherwise occupied he devoted his time to completing the notes and drawings which he accumulated regarding Porpita and Velella under less favourable circumstances at other points of Florida, at Newport, and on board the *Blake*. These notes are now published as forming the principal points in the natural history of a small and limited group of oceanic hydroids, interesting from their affinities on the one hand to the Tubularians, with which Vogt, Kölliker, and Agassiz were inclined to associate them, and on the other hand with the Siphonophoræ proper, with which they have, however, but little in common. Mr. C. O. Whitman was sent this spring to Key West to complete this memoir, and especially to investigate anew the whole subject of the structure and functions of the so-called yellow cells; but although he spent six weeks at Key West, he was unable to accomplish the object of his trip, as not a single Velella appeared at Key West during the whole of his visit. Under these circumstances Prof. A. Agassiz thought it advisable to at once publish his drawings and notes, completing the descriptive part when the necessary preparations can be finished. The Florida species of Velella (*V. mutica*, Bosc) is much larger than the Mediterranean form (*V. spirans*); specimens measuring nearly four inches in length are not uncommon. On plate 1 is figured in profile and from above and below a huge Velella nearly five inches in length, and in all the glories of its metallic colouring. Thousands of this species are brought by favourable winds and tides into Key West Harbour; they are usually seen in large schools, and although capable of considerable independent movement by means of their tentacles in a smooth sea, yet are they practically at the mercies of the winds and currents. Even moderate waves destroy them in vast numbers. When kept in confinement they soon die, and are rapidly decomposed. The dead floats are thrown ashore in enormous numbers. The large central polypite of the system is the main feeding mouth, but the smaller lateral polypites feed also to a limited extent. All these are connected at their base with the general vascular system, through which as in the polypites the fluids are rapidly propelled by the action of ciliæ lining the inner walls. At the base of the polypite there are, according to its size, from five to eight clusters of Medusæ buds: the small ones already contain the peculiar yellow cells so characteristic of the free Medusæ. The young Medusæ have a very striking resemblance to such Tubularian Medusa as Esuphysa and Ectopleura. It has like them a row of lasso cells extending from the base of the tentacles to the abactinal pole. The yellow cells are arranged in clusters along the sides of the four broad chymiferous tubes, as well as on the surface of the short, rounded, conical, rudimentary proboscis. The young Medusæ move with considerable activity by sudden jerks. The air-tubes branch much less frequently than is the case in the Mediterranean species. All the Velellæ floats examined were left-handed.

The Florida species of Porpita (*P. linneana*, Less.) is nearly related to but is larger than *P. mediterranea*. It is capable of a considerable control over its movements, and is not stranded at all in the same numbers as is Velella. If upset by wind or waves it can, by the great size and power of its numerous long marginal tentacles force itself back again into its normal position. It does this by bringing its tentacles together over the disk and throwing up the free edge of the mantle slowly in a given direction, then expanding the tentacles of one side far over in the opposite direction beyond the central part of the disk, it readily changes the centre of gravity, and so tilts the overturned disk back again. Round the base of a large central polypite are five to six rows of small, stout, flesh-coloured, feeding and reproductive polyps; these have a slightly rectangular head capable of considerable expansion, with four clusters of lasso cells. At their base are to be found Medusæ buds in all stages of development. When the clusters of these are well developed they completely fill the space between the small

polypites, giving to the ring which they occupy on the lower surface of the float, a dark yellowish tint from the colour of the yellow cells, found along the rudimentary proboscis of the Medusæ buds, as well as along the chymiferous tubes. The large marginal tentacles are of a bluish tint, their knobs of a darker colour. The smaller polypites occupy on the lower surface that portion of the mantle which covers the ring formed by the so-called white plate of Kölliker round the base of the single central polypite. Sometimes these polypites are seated in cavities of the white plate, and sometimes projections of this latter will be found to extend far up into the lower part of the small polypites. This white or pinkish plate consists of an irregularly anastomosing system of needles and spurs, or of bars of greater or smaller size, leaving a series of narrow openings for the passage of the tubules. Prof. A. Agassiz suggests the alliance of Porpita with the Hydrocorallinæ, basing this suggestion on the presence of the white plate, and of its peculiar structure, which reminds him of the porous structure of the corallum of Sporadopora, Allopora, Millepora, and although, of course, not having the regular horizontal floors of the latter, yet possessing, like these genera, large pits, the whole mass being riddled with passages and openings, forming the spongy mass of the white plate. If this homology be correct, it shows far-reaching affinities in the Porpitidæ. The Plates, twelve in number, give a great number of anatomical details, and there are full-sized and coloured representations of the two species described.

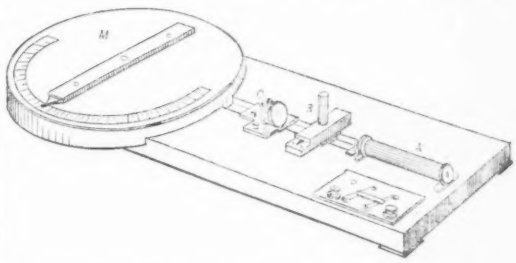
HUGHES' NEW MAGNETIC BALANCE

A NEW magnetic balance has been described before the Royal Society by Prof. D. E. Hughes, F.R.S., which he has devised in the course of carrying out his researches on the differences between different kinds of iron and steel. The instrument is thus described in the *Proceedings of the Royal Society* :—

"It consists of a delicate silk-fibre-suspended magnetic needle, 5 cms. in length, its pointer resting near an index having a single fine black line or mark for its zero, the movement of the needle on the other side of zero being limited to 5 mms. by means of two ivory stops or projections. When the north end of the needle and its index zero are north, the needle rests at its index zero, but the slightest external influence, such as a piece of iron 1 mm. in diameter 10 cms. distant, deflects the needle to the right or left according to the polarity of its magnetism, and with a force proportional to its power. If we place on the opposite side of the needle at the same distance a wire possessing similar polarity and force, the two are equal, and the needle returns to zero ; and if we know the magnetic value required to produce a balance we know the value of both. In order to balance any wire or piece of iron placed in a position east and west, a magnetic compensator is used, consisting of a powerful bar magnet free to revolve upon a central pivot placed at a distance of 30 or more cms. so as to be able to obtain delicate observations. This turns upon an index, the degrees of which are marked for equal degrees of magnetic action upon the needle. A coil of insulated wire, through which a feeble electric current is passing, magnetises the piece of iron under observation, but, as the coil itself would act upon the needle, this is balanced by an equal and opposing coil on the opposite side, and we are thus enabled to observe the magnetism due to the iron alone. A reversing key, resistance coils, and a Daniell cell are required."

The general design of the instrument, as shown in a somewhat crude form when first exhibited, is given in the figure, where A is the magnetising coil within which the sample of iron or steel wire to be tested is placed, B the suspended needle, C the compensating coil, and M the magnet used as a compensator, having a scale beneath it divided into quarter degrees.

The idea of employing a magnet as compensator in a magnetic balance is not new, this disposition having been used by Prof. von Feilitzsch in 1856 in his researches on the magnetising influence of the current. In von Feilitzsch's balance, however, the compensating magnet



was placed end-on to the needle, and its directive action was diminished at will, not by turning it round on its centre, but by shifting it to a greater distance along a linear scale below it. The form now given by Hughes to the balance is one of so great compactness and convenience that it will probably prove a most acceptable addition to the resources of the physical laboratory.

WINTER LIFE AT SPITZBERGEN

THE following is an extract of a report by one of the *personnel* of the Swedish Meteorological Expedition of the wintering at Spitzbergen :—

One of the deepest fjords of Spitzbergen is the Ice Fjord on the west coast. On a map of the islands it will be seen, some fifteen miles from the mouth, to split into two smaller ones. The promontory which divides the two is Cape Thordsten. It is formed of slate rocks some 2000 feet in height, from which in some places precipices descend perpendicularly into the sea, and in others valleys slope down into the plain. The latter is furrowed by streamlets and deep ravines, while the rocks around are the breeding places of every sea bird of the Arctic fauna, as, for instance, the seagull, the auk, the rodge, and the *Uria grylle*. In the plain reindeers graze, and on the mountains ptarmigans and snow-sparrows breed. The plain is covered with grass, rather strongly interspersed with moss, but here are to be found many plants and flowers, such as *Polymonium pulchellum*, *Dryas ortopetula*, the white and red saxifrage, the Spitzbergen poppy, and the common buttercup.

In the plain close to the mountain the huts are situated which now bear the name of "Smith's Observatory," from the munificent equipper of the expedition. The buildings were erected here some ten years ago by the Ice Fjord Company, which was formed for the utilisation for guano of the coprolite deposits found in the adjacent mountains.

On July 21, 1882, the vessels of the expedition arrived here, but it was at that period doubtful whether we should establish our station here, as the mountains around contain a large quantity of hyperite, a mineral which it was feared would affect the magnetical instruments. We found on landing a line of metals up the hill, with a gradient of 45°, a winch being fixed at the other end for its working. Here was also, still intact, the little dwelling house on four poles, alongside which we found the material required for the building of a new house as stated in works on Spitzbergen. Near to the house is a cross raised with the following inscription : *Her hviler Stövet af* 15 *Mænd, som döde her i Foraaret* 1873. *Fred med deres Stöv.* This is the epitaph to the Norwegian fishermen who sadly perished here ten years ago.

We found by experiments that the mineral in question did not affect the magnetic instruments, and decided therefore to establish the station here. We had a hard time to get everything in readiness, as, for instance, the building of the magnetic hut and the thermometer cage, by August 15, when the observations were to begin, but on August 22 we had so far advanced that both magnetical and meteorological observations could be prosecuted simultaneously.

The view from the observatory was grand. Heavy clouds generally cover the sky, driven hither and thither by strong gales; below the sea roars, with ice floes floating on its crest, while thousands of sea birds wheel in the air. Suddenly the clouds part, and the sun comes forth, the snow-white peaks flash in the rays, the stony ridges become purple, and down below the dark gloomy sea assumes the colour of the sapphire.

On August 23 the sun set for the first time, and on October 23 it did not appear. Already, on August 31, the ground became covered with snow, but early in September, and towards the middle of October, it again thawed, and it was not until October 21 that the snow remained. The birds now began to leave, and the *Tringa maritima* were last seen on August 20. The brent geese soon departed in flocks, and flew cackling southwards out of the fjord. The last was seen on September 13. On October 14 we saw an eider, and some specimens of *Procellaria glacialis*, and on October 21 a snow-sparrow appeared at the station. From that date none of the migratory fauna was seen until the spring. Quite alone, however, we were not, as the mountain foxes soon appeared, and were not the least shy. Ptarmigans were plentiful, too, in the ravines, where they feasted on *Polygonum* seed. On October 26 we shot the first two reindeer at Sauriehook, but it was not until the spring that they came in any numbers.

Our work progressed too. We had first of all to fix the anemometer and the weathercock on the mountain above the station, or 800 feet above the sea, and to connect it with the observatory by a telegraph wire, as the readings were to be made by electricity. Then there was a workroom to be constructed, and the astronomical observatory for the passage instruments to be erected. On October 3 the wire to the anemometer was ready, and the hut carried up to the top of the mountain, where it was fixed. On October 25 the astronomical observatory was finished. It was now so dark that no work could be done outdoors, and on October 23 it was necessary to light up at 3 p.m., on October 28 at 2 p.m., and on November 2 light was necessary throughout the day. The Polar night had set in.

From October 23 until February 18 the sun remained below the horizon; thus for a period of 118 days and nights. At first it was not quite dark at noon, but from November 11 it was a night throughout. On November 12 a thin layer of ice appeared on the Ice Fjord, which gradually increased in thickness, but it was afterwards broken up and again formed several times during the dark winter. It was only when the light came back that the ice formed in a bridge across the fjord.

Now the island was in darkness and perfectly deserted. The terrible winter storms had commenced, and it was 16° C. below freezing-point. And the snow! Snow on the mountains, snow on the plain, snow on the huts, snow covers the little windows, snow comes in through the chimney, and even the thermometer cage cannot exclude the tiny, pointed crystals which penetrate even a keyhole. In such an hour it was a delightful sensation to seek the hearth in the library!

Again I stand by the shore. The clouds have cleared away; only one enormous mass, which we never saw lifting, lies over the mountains across the fjord. The sky s clear, the ocean roars below, there is no ice; the moon is about to pass her meridian.

Slowly one long tidal wave after another comes rolling towards the shore; they gather into one tremendous wave, which, striking the lofty rocks, sends its spray a couple of hundred feet into the air. Then it recedes with a deep sigh, leaving two or three magnificent ocean algæ, each a yard long, on the shore.

When the moon is absent, it is, however, pitch dark, provided there is no aurora borealis. The aurora borealis was observed throughout the winter, when it was clear, and in every form and position.

Now a faint arc appears far down on the south horizon. Below it is a dark segment. Slowly it travels towards the zenith, increasing in intensity. It is perfectly symmetrical, and both its points almost touch the horizon, and strike east and west as the arc moves upwards. No streamers can be made out in it, and the whole forms one continuous layer of light of a strange transparent yellow colour. The arc is broad; its size is three times that of the rainbow, and its edge, which is far more defined than that of the rainbow, forms a strong contrast to the dark sky of the Arctic heavens. Higher and higher the arc travels; in the whole display there is a solemn rest, and only here and there a wave of light suddenly leaps upwards. Above the snowy fields yonder it begins again to get clearer. Still it is far from the zenith, and already another arc separates itself from the segment in the south, and by degrees others follow. All of them now travel towards the zenith, traverse the point and descend on the northern horizon, while some rapidly recede to where they originated. Seldom, however, does the aurora appear in this regular and defined form.

In the corner of the horizon lies a light cloud-mass. Its upper rim is illuminated, and from this a luminous band is quickly developed, which spreads east and west, increases in intensity, and travels towards the zenith. The colour is the same as that of the arc, but the intensity is greater. In a constantly changing play the band slowly alters, but remains continuous in form and plane. Now it is interlaced into several plaits and folds, but throughout there is an undulatory motion which throws waves of light through the band in its entire stretch from right to left, or *vice versâ*. Again it unfolds itself and forms into draperies and festoons, which are lost in the depths of the horizon.

On another occasion the band assumes quite a different form. It then consists not only of luminous matter, but also of solitary streamers ranged in a parallel plane, all pointing to the magnetic pole. In each of the streamers the intensity is, through the light-waves which follow in rapid succession, greatly increased, which gives the streamers the appearance of being in a constant leaping motion, while the two edges, green and red in colour, move wave-like up and down, according to the play of the coursing waves of light. Often the streamers prolong themselves throughout the entire band; they stretch even as far as the magnetic pole, and then remain at rest. They are sharply defined, but fainter in light than the band itself, and do not lie close together. They are yellow in colour, and appear like millions of fine threads of gold thrown across the firmament. Again a thin veil of light creeps over the starry heavens, and the golden threads of which it is woven stand clearly out from the background, while its lower *garniture* is formed of a broad, intense, yellow-white border with a thousand filaments in a slow but constant motion.

Again it appears in a third form. Throughout the day bands of every form and grade of intensity have been drifting over the sky. It is eight o'clock in the evening, the hour when the aurora borealis reaches its greatest intensity. At the present moment only a few groups of streamers stand in the firmament, while down in the south, just above the horizon, lies a faint band which is hardly noticed. But suddenly it begins to move upwards with great rapidity, spreads its folds out east and west, the

light-waves begin to leap in it, and long, solitary pillars shoot towards the zenith. At this moment there comes life into the sky. From every quarter of the firmament streamers come rushing with the speed of lightning towards the zenith. The little, fiery tongues whirl round, or sway to and fro, appearing as though they were Cupids in golden mantles with borders of purple. They dart and leap in vain to reach the zenith; they begin to move wave-like, slower and slower; they seem to get tired, still they whirl on towards the north, when suddenly they lose in intensity, and, in a fraction of a second, vanish!

It is again dark and cold; a thin veil of light again begins to form over the star-covered sky. This is as the aurora appears in its grandest form, and any description of it would fail to give even an idea approaching its real majesty and even grandeur.

In addition to the meteorological and magnetic observations, those of the aurora borealis were also made during the Polar night by means of the well known theodolite, and from October the electricity of the air was also examined. On the two agreed dates, the 1st and 15th of every month, the magnets and the aurora were examined and registered every fifth minute, and during one hour, every twentieth second. Besides these observations, meteors and shooting stars were watched and carefully noted, attempts made to measure the quantity of the snow, measurements of the aurora borealis effected, along with astronomical determinations of hour and place, absolute magnetic measurements, simultaneous observations every twentieth second of the magnets, the aurora, and the electrometer, and researches on the moisture of the air, and the nightly radiation, while the temperature of the snow was examined at various depths.

Already in October the remarkable depressing influence which darkness exercises on the human mind, with which every one who has wintered in the Arctic regions is familiar, began to be manifest. In that month it was, however, felt only slightly, but with November it rapidly increased, and at the end of December it had reached "the first stage of insanity." This influence caused a remarkable dislike to conversation, accompanied by great lassitude. When lying down, phantoms of the scurvy crept over one's mind, and the thought uppermost was that here, next to us, the bodies of fifteen brave men were found in a horrible condition ten years ago. The best cure for this was, we found, an exhausting walk, a good dinner, and a few glasses of lime-juice accompanied with the cheering thought that our expedition formed one of the moments in the great work of the human race.

The moonlight during midwinter was very remarkable, and imparted in the day a transparency to the air which we had never seen before. The greatest mountains did not oppress the eye, but seemed to assume a lightness which made them appear as if they were floating on the dark background.

On February 19 the sun was to reappear, but already on January 23 it was so light that we could read fine print out of doors, and on February 8 we could, at 11 a.m., read the thermometers in the cage without a lantern. On February 19 the sun came at last. During these days the scenery was magnificent. On the light sky clouds of every shape floated, coloured in the loveliest tints by the sun's rays, while over the whole was cast a hue of purple and gold.

In the beginning after the sun's return, auroræ were still seen in the night, but on March 25 we saw the last of this phenomenon. Eventually on April 19 the sun became circumpolar, and from that date we had perfect daylight.

We often noticed during the spring a thick, cold haze lying over the landscape, in which mock suns and some other optical phenomena were frequently seen, caused by the reflection of the sun's rays in the ice-crystals.

The fjord was in the light period entirely covered with ice, and, as the sun reappeared, even the open leads which could be seen between the ice-floes became covered with thin ice. Only far out on the horizon above the fjord a "water cloud," bespeaking open water, could be seen, and the increase or decrease of this we watched with great interest.

The migratory birds now began to arrive, and the *Procellaria glacialis* was already seen on February 7. On April 13 the first snow-sparrow came, soon after followed by the auks, the rodges, and the seagulls. The ptarmigans, which had lived in flocks during the winter, now began to separate, and preferred the mountains to the plains.

The observations were steadily continued, and the particular object of the researches of the meteorologist at this period was the radiation from the snow's surface. We thus believe we have discovered that the thermometers in the cage did not give the true temperature of the air, which was to be tested by means of a "swing" thermometer, *i.e.* a thermometer fastened to a cord, and then swung rapidly round, as such a thermometer will give the air's exact temperature as near as possible. Under these observations, which were made every hour, it, however, often happened that the cord broke, and the instrument suffered injury. In order to avoid this a mechanism was constructed, driven by hand, which kept the thermometer in a constant rotary motion, and from May 4 until the end of the month, when the thaw set in, this thermometer was read every hour. Another subject also investigated, from February 15, was the temperature of the snow on the surface and at three different depths.

During the light period three hydrographic-magnetic excursions of research were made on the ice in the Ice Fjord, viz. on April 19, April 24, and May 24. The longest of these, the one on May 24, extended six miles from the shore, and it was very difficult work to drag the sleigh over the rough ice. The results of the same were several absolute magnetic measurements, observations of the temperature of the sea at various depths, and testings of the saltness of the water. The greatest depth found was 250 metres.

At the same time, while the snow still remained on the ground, several topographical works were effected. A base some 600 metres long was measured between the universal instrument and a pole south of the same, while two signal posts were erected on two crests south-west and north-east of the station, and three miles apart. Afterwards the greater base was determined by means of triangular measurements from the smaller, in order to serve as a basis for further work. In addition to this there was built, on the sun's return, an astronomical observatory for the universal instrument, which was finished on February 14, and finally a magnetic hut was built for the Wrede's variation instrument, finished on May 19.

There was, during the dark period, one question which was much discussed, and which we were anxious to test, viz. whether the Polar night has the effect of turning the complexion white. On January 23, therefore, when it was light enough to see out of doors, we assembled in the open to examine our faces, and the concensus of opinion was that the darkness had not affected the skin in the least.

In the end of May the thaw set in in earnest, and soon mosses and shrubs came forth. In the beginning of June the fjord was still covered with ice, but by the 11th it commenced to open towards the sea, and by the 21st it began to break up and drift. On July 4 the fjord was free from ice.

The fauna now began to appear: thus already on June 2 the red blossoms of *Saxifraga oppositifolia* came out from the snow; on June 11 *Salix polaris* was in bloom, as well as *Draba wahlenbergii*, and soon the plains were covered with flowers.

At that time some exceedingly interesting experiments in horticulture were commenced. A small garden was first formed by breaking up the layer of turf on the surface, to enable the sun to thaw the frozen earth underneath, and in this manner sufficient mould was obtained to lay out proper beds. In these were then planted seeds, among others radishes brought from Sweden, while several species of the Spitzbergen fauna were planted here. Both flourished remarkably, as did also the rye and oats which we planted here. The latter grew well, although slowly, and were, at the end of July, six to eight centimetres long. Their growth was measured every fifth day, while studies of the sun's chemical influence on the same were simultaneously prosecuted.

The migratory birds continued to arrive: thus on June 2 the brent geese put in their appearance, and in great flocks took possession of the innumerable lagoons. They were, however, very shy, and comparatively few were shot. Of wild reindeer several were shot, and one Polar bear was seen, but escaped.

At last on June 26, at 4 p.m., the first reminder of the outside world appeared in the shape of a fishing smack, but, although every effort was made to attract attention, she passed northwards. On July 8 an expedition was despatched to Cape Staratschin, the "general post-office" of Spitzbergen, which brought back news, letters, and the literature of the civilised world for a whole twelvemonth, the period of our isolation.

Shortly afterwards we had several calls of Norwegian hunters, among whom may be mentioned the well known Capt. Kjeldsen, of the *Isbjörnen*, who participated in the Payer-Weyprecht expedition of 1872, and in the Austrian to Jan-Mayen, 1882-83. He made the remarkable report that he had found the sea at the Norse Islands early in July this summer entirely free from ice, not even seeing the "ice-blink," *i.e.* the light reflected from new ice formed out of sight. This was in the exact spot where the Swedish expedition was compelled to return on account of enormous pack-ice, at the same period in 1882. He was of the opinion that a steamer would have been able to penetrate very far north of the Seven Islands this summer.

In the middle of August the relief boat *Urd* arrived, and, after having cleared the houses, and nailed up the windows and doors, we went on board, and steamed out of the Ice Fjord on August 25, having for a period of exactly 400 days, contributed our quota to International Polar research.

THE WEIGHTS OF BRITISH NOBLEMEN DURING THE LAST THREE GENERATIONS

IT is of considerable interest to know in an exact way the amount of change that may have occurred in our race during recent generations. I therefore send the following results concerning the changes in weight, which I have calculated from data obligingly furnished to me by Messrs. Berry, of 3, St. James's Street, London. Messrs. Berry are the heads of an old-established firm of wine and coffee merchants, who keep two huge beam scales in their shop, one for their goods, and the other for the use and amusement of their customers. Upwards of 20,000 persons have been weighed in them since the middle of last century down to the present day, and the results are recorded in well-indexed ledgers. Some of those who had town houses have been weighed year after year during the Parliamentary season for the whole period of their adult lives. I examined two of the ledgers at my own house, and was satisfied of their genuineness and accuracy; also that they could be accepted as weighings in "ordinary indoor clothing" unless otherwise stated. Much personal interest attaches itself to these unique registers, for they contain a large proportion of the historical names in our upper classes.

I have ventured to discuss only a small and definite part of this mass of material, and I selected the nobility for the purpose, because the dates of their births could be easily learnt, which had to be done in order to connect the years in which they were weighed with their ages at the time. They formed a more homogeneous group than one that included younger brothers and men about town, who marry late and lead less regular lives. I therefore begged Messrs. Berry to find a clerk for me who should make the required extracts under their direction in an anonymous form for statistical purposes. I also asked to be furnished with an alphabetical list of the persons weighed, that I might know generally with whom I was dealing, and that each schedule should bear a reference to the folio whence it was extracted, so that, whenever verification was needed, the original might be referred to. All this was done, and I am in possession of 139 schedules referring to as many different persons, namely, 109 peers, 29 baronets (who were added as makeweights), and 1 eldest son of a peer. They were born at various times between 1740 and 1830, or thereabouts. Each schedule gives the age and year of the several weighings, the highest and lowest weights recorded in that year, and a copy of such remarks as were entered at the time about the dress. An age-weight trace similar to those in Figs. 1 and 2 was plotted on a large scale on each schedule. My best thanks are due to Messrs. Berry for their careful oversight of the tedious clerical work and for the intelligent assistance they gave in having it satisfactorily accomplished.

Specimens of the Age-Weight Curves of Individuals

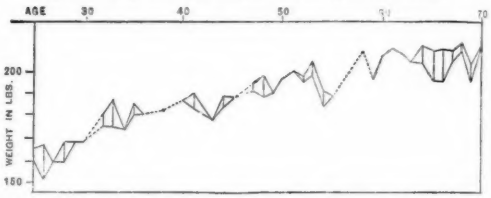


FIG. 1.—One-fourth of the Series are more irregular than this Specimen. (The Upper Quartile.)

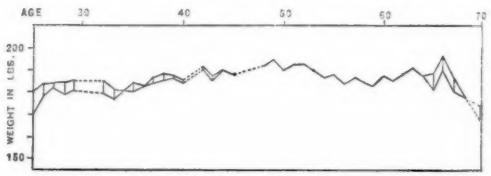


FIG. 2.—One-fourth of the Series are less irregular than this Specimen. (The Lower Quartile.)

The age-weight traces differ widely and in many ways: (1) in the annual range of weight, (2) in its fluctuations from year to year, (3) in the age at which the weight reaches its maximum, (4) in the bluntness of the culminating point.

The annual range is shown in Figs. 1 and 2 by the short, v rtical lines that connect the upper and lower contours. The top of each line corresponds to the highest weight recorded in the year to which it refers, and the bottom of the line to the lowest. I find the average annual range in my whole series of cases to be 6 lbs., and that, in the successive decades extending over ninety years, it has decreased prettily steadily from 7 lbs. to 5 lbs. This points to an irregularity in the mode of life that was greater two or three generations back than now, and we shall shortly see that it is by no means a solitary indication of this well known fact. It would be interesting to learn how much annual irregularity in the weight of an adult is consistent with perfect health.

The only evidence I know that could throw much light upon it is summarised in a Parliamentary paper on prison discipline,[1] whence it appears (p. 54) that a certain amount of irregularity is normal among prisoners, that they are heavier in summer than in winter, and that the changes are abrupt; also, that fluctuations in weight, bearing no sort of proportion to previous changes of diet, are of constant occurrence.

I calculated a rough numerical measure of the irregularity of each trace for the purpose of classifying them. I did so on the same principle that one might adopt to measure the discursiveness of a rambling path, in comparison with that of a straight turnpike road between the same points, namely, by finding the proportion that the length of the one bore to the other. I measured the trace and also the general sweep of the trace with a map-maker's "perambulator," divided one by the other, and corrected each result on the principle that a fluctuation of 12 lbs. in a man of 16 stone should not count more than one of 9 lbs. in a man of 12 stone. I also exercised some judgment in my measurements, to avoid the error of dealing with ups and downs in the trace that were apparently due to the fragmentary character of the observations (sometimes only one record in a year, and sometimes two), as if they were real fluctuations. Each available trace was marked on this principle, and the traces were classified according to their marks. Figs. 1 and 2 are the "quartiles" of this class.

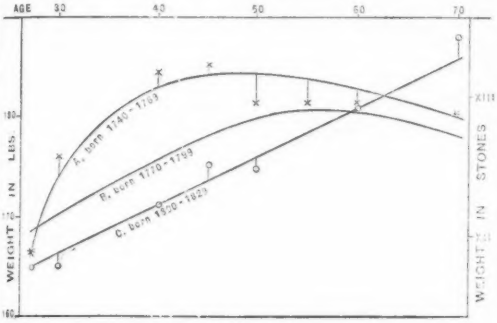


Fig. 3.—Mean Age-Weight of British Noblemen in three successive generations

One quarter of all the traces are more irregular than Fig. 1, one quarter are less irregular than Fig. 2, and the remaining two quarters lie between them. The "median" trace occupies the half-way position; it is unnecessary to reproduce it here, as an imaginary interpolation between Figs. 1 and 2 will suffice.

I next divided the traces into three divisions, A, B, and C, according to the dates of birth of the persons they referred to. It happened that each division covered a period of thirty years, so A, B, and C may be taken to represent three successive generations, born respectively between 1740 and 1769, 1770 and 1799, 1800 and 1829. The numbers of traces available for the present purpose were 21, 22, and 26 respectively. It appeared that the most irregular trace in Group C would rank only as the seventh in Group B, and as the fifth in Group A, and yet C contains the greatest number of cases.

There can be no doubt that the dissolute life led by the upper classes about the beginning of this century, which is so graphically described by Mr. Trevelyan in his "Life of Fox," has left its mark on their age-weight traces. It would be most interesting to collate these violent fluctuations with events in their medical life-histories; but, failing such information, we can only speculate on them, much as Elaine did on the dints in the shield of Launcelot, and on looking at some huge notch in the trace, may hazard the guess, "Ah, what a stroke of gout was there!"

The age at which the weight reaches its maximum is earlier in the earlier generations. I attempted eye estimates, and found it comparatively easy to form them in respect to the traces of the earlier period, where the culmination was usually distinct, and found that it frequently occurred at an early age; the number of times in which it took place in the successive decades of life in those days being as follows: under the age of 29, 2 cases; 30-9, 5 cases; 40-9, 6; 50-9, 7; 60-9, 12; 70 and upwards, 2. In the latter generations the culminating point was frequently too indistinct to be localised, so that I am unable to offer a corresponding statement for comparison that would be trustworthy. In short, the development of the latter generations was more regular.

The clearest evidence of the different age-weights in the three generations, A, B, and C, is obtained by comparing their Means. The following is a brief numerical abstract of them to which the number of cases upon which each mean is based is added in a different type below it. The figures in parentheses are doubly meaned results, those to the left being derived from observations made at the ages of 26 and 28, and those to the right from observations at 68 and 72. For purposes of comparison I subjoin the weights of the professional classes, extracted by interpolation from the table, published by the Anthropometric Committee of the British Association in their Report, 1883, p. 40. The number of observations on which these are based, are given in a form that does not admit of strict comparison with those of my series. They are 24, for observations at the ages 30-35; 24, for 35-40; 44, for 40-50; 13, for 50-60; 5, for 60-70.

Mean Weights at Various Ages

Class	Years of Age					
	27	32	40	50	60	70
A	(166) (13)	172 18	181 24	181 21	181 13	(180) (12)
B	(168) (24)	171 23	172 24	184 20	178 20	178 (15)
C	(165) (36)	165 44	171 43	175 37	181 22	(188) (7)
Professional	151	167	173	174	174	—

These figures are rendered much more expressive by translating them into smoothed curves; those from which A was drawn are shown by crosses; those from which C was drawn are shown by small circles; but those from which B was drawn are omitted for clearness' sake.

Whatever may be the exact significance of these mean values, which is by no means so clear as may at first sight be imagined, and whatever may be their absolute worth, which I do not rate very highly, there can be no doubt as to their differential importance. They show with great distinctness that the noblemen of the generation which flourished about the beginning of this century attained their meridian and declined much earlier than those of the generation 60 years their juniors. They were nearly a stone heavier at the age of 40.

The weights of these two generations were identical at the age of 62 or 63, but at that period of life the earlier generation was declining in weight with almost the exact

[1] Copies of correspondence between the Secretary of State for the Home Department and the Inspector of Prisons, &c., and the Report of a Committee, &c. Ordered to be printed May 20, 1864.

speed at which the latter was continually rising. The steadiness of the rise of the latter from early manhood to late years is very striking; it is almost in a straight line. I have not sufficient data to justify me to say when its curve culminates; I have closed it at 70 with a dotted line.

It is only necessary to add that the ledgers of Messrs. Berry are a quarry from which, with some labour, much further information of the kind just given might be drawn. Perhaps the publication of this paper will suggest methods of treating them that have not occurred to myself.

FRANCIS GALTON

THE ERUPTION OF KRAKATOA[1]

"SIXTEEN volcanoes now working between the spot where Krakatoa was before and Sebesie." Such was one of the first reports which was sent by cable to Singapore, and which we heard at Pontianak. Never before had we been so longing for news from Java, for when H.M. ship *Hydrograaf* steamed into the Padang-Tikar River, we heard heavy detonations and explosions like far-off shots, so that we were alarmed about Java. As we expected, our ship was soon ordered to survey the Sunda Straits. This survey was finished at the end of October, and the reader will probably feel interested to know what really has happened there.

Krakatoa has not entirely disappeared, while, till now, no new volcanoes are visible in the neighbourhood. But the report that new islands were said to have

FIG. 1.—Krakatoa during the eruption of May, after a drawing of the Military Survey Bureau, Batavia.

arisen between Sebesie and Krakatoa is easily to be explained, for the new islands are like a mass of smoking and steaming rocks, and if seen from afar they may easily suggest the idea of a great number of working volcanoes. But, when looked at closely, it appeared that the masses of rock were composed of hot pumice-stone, mixed with eruptive masses. In them there were a great many cracks and splits, in which, by the heavy breakers, steam of water was continually generated.

The northern part of the island has entirely disappeared. At what is now the northern edge the peak rises nearly perpendicularly from the sea, and forms a crumbled and rugged wall, and shows a vertical cutting (which is more than 800 metres high) of Krakatoa.

Where was land before, there is now no bottom to be found; at least we could not fathom it with lines of 200 fathoms (360 metres) long. When we had quite calm weather, and steamed slowly and cautiously to and fro along the base of the peak, or had turned off steam and let the ship drift, and were busy in measuring the depth, we could distinctly see the different strata and rocks of the bare, opened mountain. Only here and there a slight trace of melted volcanic matter was to be seen, which, after half of the mountain had crumbled away, had flowed over the wall, which is still there. What remains of the slopes is covered with a grayish-yellow stuff (which, as plainly appears, had been in a melted or fluid state), full of cracks or splits from which steam is continually coming out.

In the same way steam is also coming forth from the deeper cracks of the steep wall, which is still remaining. Sometimes this is accompanied by slight explosions; at that time clouds of brown dust fly up from the cracks, and stones roll down which are often so big as to disturb the sea around the entire base of the mountain. Our

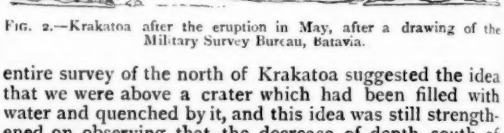


FIG. 2.—Krakatoa after the eruption in May, after a drawing of the Military Survey Bureau, Batavia.

entire survey of the north of Krakatoa suggested the idea that we were above a crater which had been filled with water and quenched by it, and this idea was still strengthened on observing that the decrease of depth, south of Sebesie, had principally been caused by matters which were cast out and flung away.

Almost in every place here the lead came up from the bottom, filled with black sand or carbonised dust, sometimes mixed with pulverised pumice-stone and little black stones, which apparently had been in a red-hot or melted state. Moreover, the soundings were very different, and the new rocks resemble clods of substances which, when

FIG. 3.—Peak of Krakatoa after the eruption in August, by M. C. van Doorn.

in a melted or very hot state, had contact with water. Probably such a whimsical shape of the rocks above the sea-level suggests the state of the bottom of the sea in the neighbourhood. The stones were still too hot to allow us to discover whether massive stones are under the pumice-stone also. It was not difficult, it is true, to knock off large pieces of these rocks by a hatchet or a chopper, but when a big block fell unexpectedly down, the sailors had often to flee on account of the gases which suddenly arose. The knocked off pieces which were brought on board were still warm after they had been in the boat for an hour.

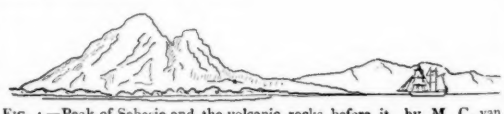


FIG. 4.—Peak of Sebesie and the volcanic rocks before it, by M. C. van Doorn.

As is to be seen from the map, a great part of the lost ground of Krakatoa is found again at the bottom of the sea, a few miles to the north at least, if we suppose that no undulations of the ground took place. After having passed the limits to which the matters were thrown out, one finds the same soundings as were found before, and the decrease of depth is so local that the idea of an upraised bottom is dissipated at once. If such an elevation had taken place, it certainly would be remarked over a far greater extent and be more regularly ascending and descending. The firmer and stronger part of the crater wall, the peak of Krakatoa, which is still there,

[1] By M. C. van Doorn, officer in command of H.M ship *Hydrograaf*. Translated (and partially abridged) by E. Metzger from *Eigen Haard*, 1883, No. 51.

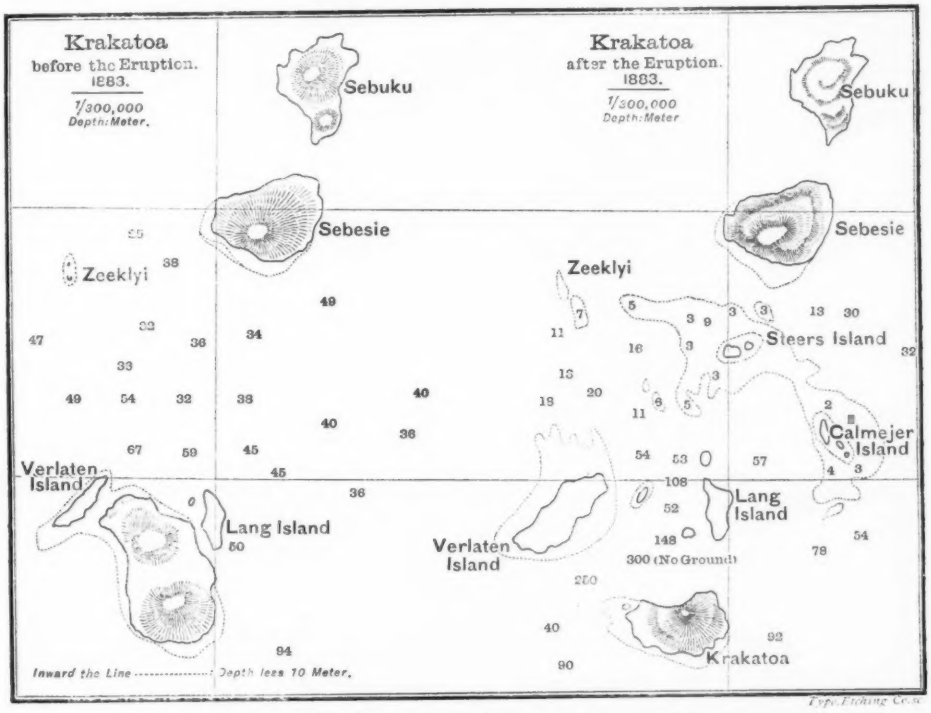
remained standing when the lower and feebler part dropped down, and the water found its way into the fearful boiling pool. We cannot wonder therefore that then a quantity of steam came forth (of which we are not able to form an idea), which caused a strong explosion. The movements of the sea which followed it caused tidal waves, the destroying force of which was experienced in such a fearful manner at the coast of Bantam and the Lampongs.

It is also worth mentioning that a change took place in the figure of Verlaten Island; the area is now triple what it was before, though it is plainly visible that large pieces of the beach were there knocked off a short time ago.

Lang Island, in size and formation, has remained almost unaltered. The sight of these islands, which were formerly covered by a luxurious vegetation, is now very melancholy. They are now buried under a mass of pumice-stone, and appear like shapeless clods of burst clay (*i.e.* covered with cracks). After a torrent of rain, the coming forth of steam is sometimes so dense that these islands, when seen from afar, appear like hilly ground covered here and there with snow. If looking at these spots with the telescopes, one can plainly see that these white specks are formed by a great number of clouds, which issued like steam from the fissures.

Sebesie is also covered with ashes up to the top—859 metres—which appear like a grayish-yellow cloth. But it seems that the cover is already less thick here, for here and there one sees the stumps of dead trees peeping out from the crust.

Sebuku shows a dreadful scene of devastation. Perhaps all that lived here is not so completely destroyed as was the case on the southern islands, but the sight of the bare



Krakatoa and neighbouring islands before and after the eruption, from official surveys.

fields of ashes, alternating with destroyed woods, the trees of which are all either dead or uprooted, gives one a still better idea of the destructive powers which were here at work. It is not until we come to the small islands northward of Sebuku that our eyes are gladdened by little specks of green.

I do not try to describe the scene of destruction and misery which we saw at Anjer and the villages along the coast. The papers have already reported the full particulars, and therefore I do not care to repeat melancholy facts which are already known.

It was a dreadful narrative which was related to us by a native, a lighthouse-keeper of Fourth Point, one of the few men at the lighthouse, who by a wonder was saved.

When the wave approached, all fled to the tower (the light was 46 metres above the sea), which, though shaking, resisted the violent waves for a long time. It was a terrible moment, when at last an enormous rock, which was swept away by the stream, crushed the base of the tower, which then fell down. The man who was saved saw his wife and his children drowned before his eyes. He related this fact in the very resigned way of a Javanese, and considered it the most natural thing in the world that he was now obliged to light the interim light, which was erected as soon as possible.

It has been almost a month that we have been in the Sunda Straits, and even in this short period we could observe that the coasts of Bantam commence to revive. From many places from the heavy rain the ashes are washed down, and a fresh green appears again. Even on the beach young cocoanut trees and banana trees are shooting out between the chaos of dead trees, blocks of rocks, &c.

Off Batavia, October 23, 1883

CHARLES WATKINS MERRIFIELD, F.R.S.

MR. CHARLES WATKINS MERRIFIELD, F.R.S., who died at Hove on the 1st inst., at the comparatively early age of fifty-six, was a native of Brighton. Having entered for the Bar, he in 1847 received from the then Marquis of Lansdowne an appointment in the Education Department of the Privy Council Office. Though called to the Bar in due course, he never practised, but was speedily promoted to the office of an Examiner, the duties of which he discharged with marked attention and success, while finding time for other work which made for him a name among men of science. Though well versed in Greek and Latin, as well as in the classic authors in French and Italian, both of which languages he wrote well and spoke fluently, the bent of his mind was decidedly towards the more exact sciences. He was an early member of the Royal Institute of Naval Architects, of which he was for many years Honorary Secretary, receiving a handsome testimonial on his retirement in 1875. Some mathematical papers he had contributed to the *Transactions* of some of the learned societies, and especially some memoirs on the calculation of elliptic integrals in the *Philosophical Transactions*, led to his election as a Fellow of the Royal Society in 1863. In 1867 the Government established the Royal School of Naval Architecture and Marine Engineering at South Kensington, and Mr. C. W. Merrifield, at the request of the authorities, accepted the office of Vice-Principal. He only intended to take this as a temporary measure, but as the result of the lamented death of Mr. Purkiss, who was to have been Principal, Mr. Merrifield was appointed to that office. On the transfer of the Institution to Greenwich in 1873, he resumed his office of Examiner in the Education Department. Mr. Merrifield was a frequent attendant at the annual meetings of the British Association, and filled the office of Vice-President of its Section of Mechanical Science at the Brighton meeting in 1875, and was President of the same Section at the Glasgow meeting in the following year. He served on many important committees of that Association; one of these was the committee whose report on the stability, propulsion, and seagoing qualities of ships in 1869 was drawn up by him, and another was the committee for reporting on Babbage's celebrated analytical machine. Mr. Merrifield was a member, and in due course became President, of the London Mathematical Society, and he held the office of Treasurer until he was compelled by his health to resign it in 1882. To some of the leading scientific journals and periodical publications his contributions, extending from 1853, have been very numerous; they may be found in the publications of the Royal Society, the *Philosophical Magazine*, the *Assurance Magazine*, the *Messenger of Mathematics*, &c. His acquaintance with mathematical arithmetic, methods of interpolation, and tabular work in general, was very wide and complete. Mr. Merrifield edited many of the works in the Text-books of Science published by Messrs. Longman, and himself wrote a successful treatise on arithmetic and mensuration as one of that series. Some of his papers on the difficult and scientifically interesting subject of sea waves were translated into Italian for the *Rivista Marittima*, in which they appear, and a footnote to one of them, after bearing testimony to the author's extensive knowledge and excellence of style, expresses the satisfaction of the editor at his adding to these qualifications that of "writing correctly our language." He was closely connected with the Association for the Improvement of Geometrical Teaching from its foundation, and took an active and leading part in the work of the Association. Mr. Merrifield served on several important Royal Commissions, including one on the seaworthiness of ships, of which the Duke of Edinburgh was President. During the last few years he frequently sat as scientific assessor to Mr. Rothery in the Wreck Court. A part of his unofficial work consisted of the conduct for many years of the mathematical part of the May examinations of the Science and Art Department. All his arrangements for this purpose were completed in 1882, when, in April of that year, he was prostrated by an attack of apoplexy. He had so far recovered as to give hopes that his life might be spared for some years, but on October 18 last he was seized with a third attack, from which he never rallied.

GEOLOGICAL SURVEY OF PRUSSIA

THE Report of this important Survey for 1882 has just been issued as a well-printed octavo volume with maps, sections, and plates of fossils. The first division is devoted to an account of the operations of the Survey in the field. These were conducted in the Harz, where the keen-eyed Lossen still wields his powerful hammer among the eruptive rocks of that classic region; where, also, Dr. von Groddeck and Herren Halfar, Dames, Branco, and von Koenen bore a share; in northern and eastern Thuringia and the Thuringerwald, where ten geologists were engaged; in Hesse-Nassau, with a force of five surveyors; in the southern part of the Rhine province, where Herr Grebe was at work; in Silesia, where the Survey was commenced by Dr. Dathe; in the Berlin district, where the superficial deposits and agricultural features were mapped, and the special geological and agricultural map of that district, consisting of thirty-six sheets, was completely surveyed; in the low grounds about Stendal and Gardelegen, in the plain of the Lower Elbe, and further east in West and East Prussia; and lastly among the diluvial and alluvial formations to the north-west of Halle.

In the course of the year eighteen sheets of maps and sections were published, including fourteen of the geological-agricultural survey of the Berlin district and four sheets of the map of older formations. The total number of sheets now published amounts to 109. There were likewise issued in 1882, besides the Annual Report, three parts of the Transactions of the Survey: viz. an account of the Coal-basin of Lower Silesia and Bohemia, by A. Schütze; descriptions of the Regular Echinids of the North German Chalk, by C. Schlüter; and a monograph of the species of Homalonotus in the Lower Devonian rocks of the Rhine, by C. Koch.

The plan of operations for 1883 included further surveys in the Harz, Thuringia, and the Thuringerwald, Hesse-Nassau, Rhine province, Silesia, and the great lowlands of Prussia.

The most important feature of the Annual Reports of the Prussian Geological Survey is the series of papers by members of the staff and others, with illustrative coloured maps and sections. Of these papers no fewer than twenty-two are published in the Report for 1882, including four by geologists not attached to the staff, and amounting in all to nearly 700 pages, with 23 plates of maps, sections, and fossils. Among these the following important communications may be cited:—"The Kulm of the Upper Harz," and "The Kersantite Dyke of the Upper Harz," by A. von Groddeck; "The Fauna of the Taunus Quartzite of the Rhine," by E. Kayser; "Preglacial Freshwater Formations in the Diluvium of North Germany," by K. Keilhack; "The Variolite-bearing Kulm Conglomerate of Hausdorf in Silesia," by E. Dathe; "New Borings in East and West Prussia," by G. Berendt and A. Jentzsch; "The Lower Devonian Rocks of the Siegerland and their Associated Veins," by H. Schmeisser; "The Trough of Eifel Limestone of Hillesheim," by E. Schulz.

NOTES

PROFESSOR SYLVESTER has been elected a Foreign Member of the Royal Academy of Sciences of Göttingen, of which he

was previously a Corresponding Member. *Science*, in speaking of Prof. Sylvester's departure from America, says:—"Prof. Sylvester's departure removes from the University not only the most distinguished scientist but the most interesting personality connected with it; and his absence will make a gap in the general life of the University no less than in his own department. It is somewhat noticeable that no American college has conferred an honorary degree upon him during his residence in this country."

AT a meeting on Tuesday, in connection with the memorial to the late Mr. Spottiswoode, Mr. De La Rue stated that he believed a portrait would be painted by Mr. John Collier, and that it would be placed along with those of other presidents of the Royal Society, in the Society's rooms.

THE death is announced, in his fifty-third year, of Mr. John Henry Dallmeyer, the well-known optician.

DR. JOHNSTON-LAVIS writes to us from Naples, Jan. 10:—"For some six days the seismographs at the Vesuvian Observatory have been in a disturbed state, and on Monday, January 7, at 1.48 p.m., a distinct shock was registered. As the sirocco was blowing, the mountain was enveloped in fog and cloud, so that on Wednesday morning when the news arrived at Naples of an eruption during the night it was received with half incredulity. The volcano appears to have commenced its violent throes about 1 a.m. on the 9th, when there issued a stream of lava which has flowed down the north-north-west side of the cone and crossed the Atrio del Cavallo. Those who were fortunate enough to look towards the mountain at about 2.30 a.m. on Wednesday morning describe the sight as splendid. The maximum explosive violence was at about 10 a.m. We passed the afternoon and evening on the mountain between the observatory and the lava stream, but were paralysed by the quantity of cloud, which prevented a near approach. To-day the view of the mountain has cleared up, but the activity seems to have much diminished. I hope to visit and photograph the crater to-morrow, when I will send more details." The *Standard's* Naples correspondent, writing on the 11th inst., says:—"The violent eruption of Vesuvius has come to a sudden close. The new mouth, which had opened just below the old crater, and from which a large stream of lava issued, flowing down the north-eastern side of the mountain, has to-day ceased to be active. On examination of the old crater, a fissure can be seen directed in a straight line to the new mouth. No signs of similar activity have been experienced since 1875, and a much stronger eruption is now looked for by Prof. Palmieri."

WE understand that Prof. McIntosh, who has undertaken some investigations for the Trawling Commission, is about to institute inquiries at St. Andrew's in connection with the Fishery Board for Scotland, in order to throw some light on the habits and time of spawning of the sole, turbot, and other flat fish. These investigations are intended to enable the Fishery Board, by artificial cultivation or otherwise, to increase the supply of these important and much-esteemed fishes, and bring them within the reach of the general community more than is at present possible, owing to their being in great part imported from Grimsby and other fishing stations, and where, the supply being often very limited, the prices are extremely high. In this and other work we believe the Fishery Board is making arrangements to provide Prof. McIntosh with tanks and other appliances, so that, in addition to assisting the Board in its scientific investigations, he will be better able to prosecute his inquiries for the Trawling Commission. It is anticipated that, while the sole and other flat fish are being studied at St. Andrew's, the herring and its allies will be investigated in a laboratory to be formed by the Fishery Board at North Berwick. Besides Prof. McIntosh, it is expected that Prof. McKendrick of Glasgow, Prof. Stirling of Aberdeen, and Prof. Schäfer of University College, London, will assist in these investigations. It is also interesting to note that, in addition to this work which it is intended to undertake, the fishery officers of the Board, at its twenty-six stations on the coasts of Scotland, and the Board's cruiser *Vigilant*, are engaged with great success in collecting materials for the Board, which, when examined, will go far to clear up many of the mysteries as to the food of fishes. The materials collected are being sent from time to time to the University of Edinburgh, where they are examined by Prof. Cossar Ewart, the convener of the Scientific Investigation Committee of the Fishery Board, and by Mr. J. Duncan Matthews, one of the laboratory assistants.

THE thirty-seventh annual general meeting of the Institution of Mechanical Engineers will be held on Thursday, January 24, and Friday, January 25, at 25, Great George Street, Westminster. The chair will be taken by the President at half-past seven p.m. on each evening. The following papers will be read and discussed as far as time will admit:—On Thursday, 24th, Experiments on Friction: Report of the Research Committee (adjourned discussion); On the Consumption of Fuel in Locomotives, by M. Georges Marié, of Paris; on Friday, 25th, On the Physical Conditions of Iron and Steel, by Prof. D. E. Hughes, F.R.S.; On Portable Railways, by M. Decauville, of Petit-Bourg, Paris; On the Moscrop Engine Recorder, and the Knowles Supplementary Governor, by Mr. Michael Longridge, of Manchester.

WE are glad to see that Dr. Doberck's enterprise is meeting with the approval it deserves in Hong Kong and China. "Dr. Doberck, the Government Astronomer, who arrived at Hong Kong a few months ago," the *Hong Kong Free Press* of Nov. 6 says, "has since been most usefully employing his time in visiting the different coast ports and Formosa, and returned from the latter yesterday. He has, we understand, verified a number of instruments belonging to the Imperial Maritime Customs of China, and has studied the geographical conditions of the coast as bearing on meteorology, a very necessary matter in order to arrive at accuracy in discussing observations. We are glad to learn that the Chinese Imperial Maritime Customs Authorities evince a strong disposition to cooperate with the Hong Kong Observatory in the matter. It is of the first importance, in order to be able to arrive at any definite results so as to be able to forecast the weather, and compile a reliable weather table, that the meteorological observations conducted at different ports on the China coast should be made at the same hour, in the same manner, and by instruments corrected to the same standard. It is to be hoped therefore that Sir Robert Hart will allow his able staff to take part in this work, and that monthly registers will be kept at all the treaty ports from Newchwang to Pakhoi and transmitted to the Hong Kong Observatory, which, by situation, is best fitted to become the centre of such a system. The Observatory in this colony is on a very modest scale, and the vote for its maintenance is a mere trifle when the good that is to be gained from it is considered, and we trust that the efforts of the astronomer will not be paralysed by too great attention to economical considerations on the part of the local government. The Inspector-General of Customs has always displayed a most laudable desire to promote improvements in lighting the coast and facilitating navigation; and he will, we hope, see his way to promote the success of Dr. Doberck's work by cooperating with the Hong Kong Observatory. The Sicawei Observatory has done some good work, but its operations have necessarily been limited owing to the absence of reliable observations at the ports. What is expected from the Government Astronomer is that ultimately he may be able not only to give forecasts of the weather but to furnish such a guide to mariners as would render

it possible to make voyages and to avoid typhoons or bad weather. The value of such a service is not measurable by mere money; it means greater security to life and property, fewer risks to shipowners, and a diminution of loss to underwriters. It would, in short, have an appreciable effect on commerce generally, and the business of this great shipping port in particular." We trust that this just and accurate view will prevail among those in a position substantially to help Dr. Doberck in his valuable work.

PROFESSOR FOREL (Morges) writes in the *Gazette de Lausanne:*—We are again passing through an earthquake period. On December 18, 1883, at 6.25 a.m., a shock was observed at Neufchâtel; on December 22, at 3 a.m., another one at Cortaillod, and at 4 a.m. at Neufchâtel and Cortaillod. On December 17 and 18 earthquakes were noticed in various parts of Italy, and on December 22, at 3.39 a.m., one at Lisbon.—A rather violent shock, followed by another an hour afterwards, was noticed at Laibach on December 31 at 3.30 a.m.—At Sadikli, near Brussa, an earthquake caused some destruction on January 3, fortunately unattended by loss of life.—The Siberian newspaper *Ssibir* reports that at Korssa Kowskoje Sjelo on Lake Baikal no less than nine earthquakes occurred during the month of September last, *i.e.* on the 3rd, 7th, 12th, 14th, 17th, 20th, 24th, 27th, and 30th of that month (old style).—A sharp shock, causing some alarm, was also felt at Messina at 11.30 on the night of the 13th inst., but no damage was done.

AT 5.25 p.m. on January 11, at Fort William, a ball of light, shaped like a pear, with the broad end downwards, was seen as if suspended midway between Ben Nevis and the Caledonian Valley. It descended till near the surface of the earth, and then it burst, lighting the whole valley. In colour it resembled the electric light. Mr. W. Gunn writes from Berwick-on-Tweed:—"On January 11, at 5.33·34 p.m., I saw a remarkably brilliant white meteor—certainly as bright as Venus—rather low down in the sky to north-north-west. Apparent motion about in a line from Vega towards a point in the horizon nearly vertically below the end of the tail in Ursa Major; seen for two or three seconds moving slowly; seemed to largely and suddenly increase in size and brightness just as it was lost to view behind some trees. Perhaps this was the bursting seen at Fort William."

THE list of lectures to be delivered before the Association Scientifique de France has been published. They will be delivered as usual at the Sorbonne, under the control of M. Milne Edwards, president of this association. Some of them will be delivered by members of the council of the Association Française, a rival institution, and it is pretty certain that the two societies will be incorporated into one single body. The Association Scientifique is the older of the two, and was created by Leverrier about twenty years ago.

WE learn from *Science* that Mr. H. M. Wilson, in charge of one of the topographical parties in Prof. A. H. Thompson's Wingate division of the U.S. Geological Survey, surveyed, during the season of 1883, about ten thousand square miles in North-Western New Mexico and North-Eastern Arizona. The area covered by his work lies between parallels of latitude 36° and 37°, and extends from meridian 109° to 111°. He also worked some smaller detached areas outside of the limits thus indicated. This region has hitherto remained a *terra incognita*, partly on account of its aridity and barren condition, and partly on account of the difficulty of traversing it. So little has been known of it that within the area surveyed by Mr. Wilson a small mountain range has been indicated as occupying two places on the same map. On the engineer's map of 1879 it is called Calabesa Mountains in the northern place, and Squash Mountains in the southern; and on the Land-Office Map for 1882 both are indicated without names. Mr. Wilson's work proves that they are one and the same, occupying a position very close to that assigned to the Squash Mountains.

NEWS has been received in Berlin from the African traveller, Dr. Richard Böhm, dated July, 1883, from Qua Mpara, on the western shore of Lake Tanganyika, near the estuary of the Lufuku River. Dr. Böhm and his companion, Paul Reichardt, seem to have settled there for some time. Before reaching Qua Mpara they met with considerable difficulties, having to combat the natives, by whom Dr. Böhm was seriously wounded. He left the Belgian station Karema at the end of June, and reached Qua Mpara on July 8. There he was seized by a fever, yet he retained sufficient energy to complete his zoological investigations (principally ornithological) and to forward the results to Europe. All his collections and his scientific instruments were unfortunately destroyed by fire on the Mto ja Ugalla. Dr. Böhm, however, set to work again and commenced making new collections, which he left at Karema in safe keeping. Amongst other things he is reported to have discovered a beautiful freshwater Medusa, with a broad, umbrella-shaped body and numerous long and short prehensile filaments; he found it in Lake Tanganyika. At the same time a report from Herr Paul Reichardt was received describing in detail the Soko so well known to readers of Livingstone. The animals live together in herds of from six to twenty individuals, and build nests on trees at an elevation of 8–19 m., the nests measuring from 1–1·2 m. in diameter. Reichardt found groups of nests in which he counted over fifty separate nests. Up to the time of sending the report Reichardt had not succeeded in securing a specimen.

IN the *Bolletino of the Italian Geographical Society* for December, 1883, Sig. Colini continues his valuable notes on the information supplied by Cavaliere Luciòli on the topography and ethnography of the Upper Amazons regions. The paper is accompanied by a large map of the Huallaga and Ucayali river basins, based on Petermann's South America, but corrected and supplemented by fresh data furnished by Luciòli. The position of a large number of tribes, many hitherto unknown, is determined along the banks of the head waters of the Amazons, and to these is added a list of about sixty others, supplied by Dr. Colini from the old records and the writings of recent explorers. But it is obvious that many of these are mere duplicates or even triplicates of the same tribes due to careless transcription, ignorance, change of tribal designations, and other sources of confusion. Thus Carapacho and Picambio are only older names of the present Caribes and Remos of the Middle Ucayali. So with the Amalmacas, Chuntagurus, and Tambas of the older writers, who may be safely identified with the modern Amahuacs, Chontaguiros, and Campas respectively. Nor, as Colini rightly remarks, are these names always distinctly tribal, but the designations of mere clans, or small family groups, or members of larger divisions. These are continually shifting their locality, disappearing, or becoming absorbed in more powerful groups, another fruitful source of perplexity in the ethnical terminology of the Amazons regions. But, after making all due allowance for this uncertain nomenclature, there still remains a surprising number of really distinct tribal groups scattered along the banks of the Huallaga, Napo, Ucayali, and other Amazonian streams, groups differing from each other always in speech and frequently in habits, usages, and physical type.

ON January 26 the Berlin Wissenschaftliche Central Verein and Humboldt Academy will celebrate the fiftieth anniversary of its foundation.

THE additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus sinicus* ♂) from India, presented by Mr. C. S. Norman; two Great Kangaroos (*Macropus giganteus* ♂ ♀) from New South Wales, presented

by the Zoological and Acclimatisation Society of Melbourne; a Dorsal Squirrel (*Sciurus hypopyrrhus*) from Central America, a Greater Sulphur-crested Cockatoo (*Cacatua galerita*) from Australia, twenty-five Indian Crocodiles (*Crocodilus palustris*) from India, deposited.

OUR ASTRONOMICAL COLUMN

PARALLAXES OF SOUTHERN STARS.—We learn from Mr. Gill, H.M. Astronomer at the Cape, that he has completed a memoir on the parallax of some of the principal southern stars, founded upon observations by himself and Dr. Elkin; the memoir contains investigations on parallax of

By Gill: α Centauri (two series with different comparison-stars); Sirius; ε Indi; Lacaille 9352 (Gould's star with proper motion of 7″); o^2 Eridani, and β Centauri.

By Elkin: α Centauri (two series with different comparison-stars from Gill's); Sirius; ε Indi (also with different stars); ζ Tucani; *e* Eridani and Canopus.

Mr. Gill's important memoir has been communicated to the Royal Astronomical Society, and its publication will doubtless be awaited with much interest by astronomers.

The large proper motion of Lacaille 9352 was detected by Dr. Gould, and announced in No. 2377 of the *Astronomische Nachrichten*. The annual P.M. in arc of great circle is 6″·96 in the direction 79°·2. It is a star of 7·5 m. in Piscis Australinus: Mr. Stone's place for 1880·0 is in

R.A. 22h. 58m. 5·43s., N.P.D. 126° 32′ 40″·0.

In only one instance has the existence of a larger proper motion been discovered, viz. in that of the well known 6·7 m. Groombridge 1830 in Ursa Major, where the amount is 7″·05. ε Eridani, 4·4 m., is in R.A. 3h. 15m. 8·16s., N.P.D. 133° 31′ 46″·8 for 1880, according to Stone, who attributes to it an annual proper motion of 3″·0 in the direction 75°·5. ζ Tucani, a fourth magnitude, is in R.A. 0h. 13m. 48·60s., N.P.D. 155° 34′ 49″·0 for 1880, with an annual proper motion of 4″·35 on an angle of 74°·8, by Stone's values.

Mr. Gill expects to be in England early in February, to superintend a large amount of official printing, for which he brings copy with him.

PONS' COMET.—For a few evenings this comet will form a pretty conspicuous object as it descends in the south-western sky; after it ceases to be visible in Europe observations may be continued at the observatories of the other hemisphere for several months. On March 26 the theoretical intensity of light will be ten times, and a month later, five times, greater than at the beginning of September, when the comet was discovered through the diligent scrutiny of the heavens, followed up by Mr. Brooks, who found it considerably beyond the limits of the sweeping ephemerides then in the possession of observers. Mr. S. C. Chandler has conjectured that a meteor-stream may be connected with this comet. MM. Schulhof and Bossert's orbit for 1884 gives the radiant in R.A. 197°·8, Decl. + 67°·3.

THE MINOR PLANETS.—The *Berliner Astronomisches Jahrbuch* for 1886 contains elements and approximate ephemerides for the present year of 231 of the known members of this extensive group, only four therefore being omitted in the absence of the necessary data. In addition there are twenty-six accurate opposition-ephemerides. Four of these small planets approach the earth, within her mean distance from the sun, in 1884. At the end of December No. 132 *Æthra*, situate in the vicinity of α Orionis, will approach the earth within 0·85, and shining as a star of the ninth magnitude, will afford another favourable opportunity for the investigation of solar parallax, on the method advocated by Mr. Gill.

SCIENCE IN RUSSIA[1]

THE *Memoirs* (*Zapiski*) *of the Novorossian Society of Naturalists*, at the University of Odessa, founded only in 1873, have already reached their eighth volume, and contain a good deal of valuable work. Confining our analysis to the last three volumes, we notice in them the following papers:—In the domain of geology Prof. Sintsoff contributes several papers. One of them is an elaborate monograph on the sponges from the chalk of Saratoff. Revising his former work on the same subject, and taking advantage of the well-known work of Prof. Zittel, as well as of new extensive collections, M. Sintsoff creates a number of new species and four new genera: *Mæandroptychium*, which he proposes to substitute for those of *Cæloptychium*, *Etheridgia*, and *Tremabolites*; *Labyrintholites*, closely allied to *Plocoscyphia*; *Polyscyphia*, akin to the preceding; and *Zittelispongia*. The author describes (with figures) seven species of the first, four species of the second and the third, and one species of the fourth, as well as the following species:—*Cuculuspongia triloba*, Trautschold, *Craticularia cylindrica*, Mischl.; two species of *Ventriculites*, two species of *Coscinopora*, *Leptophragma simplex*, T. Smith, *Actinosiphonia radiata*, Fisch, and the new species *Hallirhoa peskowi* and *Isoraphinia cavata*.—The same author contributes a second paper on Mesozoic fossils from Simbirsk and Saratoff (the first paper having appeared in vol. iv.), and describes the following species:—*Ammonites longispinus* and *calcitanus*, *Scalaria dupiniana*, var. *rhodani*, *Astarte beaumontii*, *Panopæa neocomiensis*, and as new species *Aporrhais striato-carinata*, *Nucula subarduennensis*, and *Lucina neutralis*.—A third paper by the same author contains a description of the following Tertiary fossils of Novorossia:—*Dreissena rostriformis*, Desh., *Hydrobia mathildæformis*, Fuchs, *H. dimidiata*, Eichw., *Valvata variabilis*, Fuchs, *Neritina danubialis*, Pfeif., var. *liturata*, Eichw., *N. prevostriana*, Partsch., and *N. capillacea*, Brusina, from the Pliocene; *Trochus rollandianus*, d'Orb., *Phasianella kischnevia*, d'Orb., and as new species *Trochus minutus*, *semistriatus*, and *elegantulus*, *Hydrobia substriatula*, *Amnicola cyclostomoides*, and *Valvata pseudo-adcorbis*, from the Miocene. All these fossils are represented in the plates.—M. Prendel contributes a paper on the geological structure of the districts of Elizabethgrad and Alexandria, in the government of Kherson. The rocks are granites, mostly as schists, and considered by the late Barbot-de-Marny as a product of metamorphism of sedimentary rocks, and very small patches of Huronian schists, covered with numerous isolated islands of Eocene. The whole is covered with the "White Sands," where M. Prendel has found a stem of *Cupressonoxylum sverzowi*, Merklin (Miocene?), and with loess, which contains, besides the usual fossils, remains of *Arctomys bobac*, which does not now extend in Russia south of 52°–54° N. lat.—The same author contributes (vol. viii.) another paper on the crystalline rocks on the Bazavlouk and Saksagan Rivers, right tributaries of the Lower Dnieper. The paper is accompanied by a map of coloured sections of microscopic specimens of crystalline rocks.

The chief papers in these *Memoirs* are however devoted to comparative anatomy and zoology. Without attempting to summarise their varied contents, we can merely enumerate most of them. All are profusely illustrated with plates. In the sixth volume we notice a preliminary communication by Madame Olga Mechnikoff, on the anatomy of cartilaginous fishes; and a note, by Prof. H. Mechnikoff, on the larva of the *Anisoplia*.—M. Repyakoff contributes an elaborate paper on the morphology of the *Bryozoa*. Without attempting to determine the place that the Bryozoæ ought to occupy in systematic classification, the author devotes his special attention to the relations between the two great subdivisions of the Endoproct and Ectoproct Bryozoæ, and his paper is a valuable contribution to the work undertaken by Nitsche, Hatschek, Joliet, and Barrois.—M. Zabarinsky contributes a paper on the morphology of the Hydra.—In vol. vii. M. Buchinsky publishes a paper on the development of the earthworm, devoting his special attention to the development of its mesoderm and of its nervous system.—In vol. viii. M. Krasilschik contributes an elaborate paper on the development of the *Polytrema*, and the place it occupies with regard to other Flagellatæ; M. Repyakoff publishes a note on the larvæ of the *Polygordius flavocaputatus*; M. Depp, on the life of the Macropodes; and M. A. Kovalevsky, on the development of the Chiton.—In physiology we notice the researches, by M. Spiro, into the development of bile, being the result of various experiments, and accompanied with tables showing the dependence of its amount upon the food.

In botany we find the researches by M. Rishavi on the development of the organs of reproduction in *Dasya elegans* (vol. vi.); a list of lichens collected on Mount Castel in the Crimea, and determined by Dr. Brutann in Dorpat (vol. vii.); and a work, by M. Kojernikoff, on the anatomical structure of the corolla in flowers. The author has extended his researches

[1] *Memoirs of the Novorossian Society of Naturalists* (*Zapiski Novorossiyskago Obschestva Estestvoispytateley*), vols. vi., vii., and viii. Odessa.

to a great number of flowers, and has come to the conclusion that, however great the analogy between the petals and the leaves, still the former have a series of well-established anatomical features which enable us to characterise them as well as any other part of the plant. Some of their anatomical features can be explained by the physiological function of the organ, whilst the others have no connection with them, and the explanation of these peculiarities must be sought for elsewhere—says the author—in the yet unknown internal structural form of the plant as also, perhaps, in the position occupied by the flower in the whole of its organic life.

In chemistry and physics we notice two papers, by M. Tanatar, on the fumaric and maleinic acids (vol. vi.), and on their compounds with chlorite (vol. viii.); by M. Klimenko, on the lactic and propionic acids (vol. vi.); by M. Melikov, on the compounds of acrilic acid; and by M. Geritch, on electrical phenomena observed during the diffusion of several liquids.

A paper of general interest, intended to show some relations between animals and plants at their lowest degrees of development, is contributed by M. Shmankevitch (vol. vii.). When the Flagellate, *Anisonema acinus*, Blütochli—having a relatively high organisation—is cultivated for many generations in a medium which is slowly modified, for instance, in sweet water to which a certain amount of lake salt is added, its structure is modified, in proportion as the concentration of the solution of salt is increased. The individuals become less developed, their size diminishes, and the feeding-canal loses its former development. Numberless intermediate forms between the *Anisonema acinus* and its new, less developed representatives, make their appearance, as well as between these and the still lower *Anisonema sulcatum*, which would be thus but a lower organised variety of the former. When the concentration of the medium in which the *Anisonema* lives is carried on side by side with a change of temperature of the medium, the transformation goes further on, and the lowest *Anisonemæ* are transformed on the one side into algæ-like organisms, and in another direction into organisms which seem to belong to the category of fungi. The individuals not only become smaller, but they give rise also to a progeny long before reaching their full size. Under the influence of the sun's rays the uncoloured Flagellatæ acquire a new physiological function, and develop chlorophyll. "We see thus," the author says, "the beginnings of two kingdoms, animal and vegetable, radiating from one common stem. We see the transformation of one of them into the other, not only in its morphological features, but also in its physiological functions, under the direct influence of physical and chemical agencies. The saline solutions, as compared with sweet water, diminish the size of the lower organisms, and at the same time they contribute towards the development of chlorophyll in the sweet-water algæ, thus giving them, so to say, a more vegetable character, together with an increased productivenes." And further: "While descending from the *Anisonema sulcatum* to a unicellular alga, we see the regressive development, a simplification of organisation; we descend towards the plants containing chlorophyll. . . . While descending from the same *Anisonema* on another branch, we enter into the region of such lower organisms which, under the influence of another medium, do not develop chlorophyll, and having no nutrition from the air, find their food from the substratum; they could be described as parasitic Rhizopodæ, and this the more as from the fungoid form we can ascend, under some circumstances, not only towards the Amœba-like uncoloured Flagellata, but also towards the moving Monad. On the contrary, by reversing the physical agencies, we can arrive, from the unicellular alga, as well as from the fungoid form, to an uncoloured form having the structure of the *Anisonema*." The researches of A. Giard, Cienkowsky, and Famintzyn, and some observations by Ray Lankester, seem to be, in the author's opinion, in accordance with the above.

PROFESSOR HAECKEL ON THE ORDERS OF THE RADIOLARIA[1]

[THE following translation of a recent paper of mine, by Miss Nellie Maclagan, has been revised by myself.—ERNST HAECKEL.]

THE "Outline of a Radiolarian System founded on Studies of the *Challenger* Radiolaria," published by me in the *Jenaische Zeitschrift für Naturwissenschaft* (Bd. xv. pp. 418-472), shortly before starting for Ceylon in October, 1881, gave a very short survey of the systematic results of the researches which I had been carrying on since 1876 among the inconceivably rich Radiolarian material of the *Challenger* collection. At that time I distinguished in this Rhizopod class seven different orders (p. 421) and 24 families, containing in all 630 genera ("Prodromus Systematis Radiolarium," *l.c.*, pp. 423–472). I was able even then to distinguish no less than 2000 new species, and this goodly number has since been considerably increased. Further investigations corroborated all the principal essential points of the views then briefly given as to the morphologico-phylogenetic conditions of relation among this Protista class, but I gradually came to simplify my views as to the relation of the principal groups, and have now reduced the seven orders to four, which makes the complicated system much more comprehensible.

The systematic arrangement of the 15 families, given in my "Monographie der Radiolarien," 1862 (following Johann Müller, who first broke ground in his treatise, 1858) was essentially improved by Richard Hertwig, whose admirable work on the "Organismus der Radiolarien," 1879, thoroughly explained for the first time the difficult histology of these Protista, and definitely determined their unicellular nature, despite all peculiar modifications of the cell structure. On the ground of important differences discovered by him in the structure of the membrane of the central capsule, and the consequent varying comportment of the passage of pseudopodia, Hertwig distinguished the following six orders (*l.c.* p. 133):—1. *Thalassicollæ*, monozoic uninuclear Radiolarians, having the capsule membrane pierced on all sides: skeleton siliceous, irregular, or wanting. 2 *Sphærozoea*, polyzoic multinuclear Radiolarians, having the capsule membrane pierced on all sides: skeleton siliceous, irregular, or wanting. 3. *Peripylea*, monozoic uninuclear Radiolarians, having the capsule membrane pierced on all sides: skeleton siliceous, consisting of fenestrated spheres or modified fenestrated spheres or disks. 4. *Acanthometrea*, monozoic uninuclear Radiolarians, having the capsule membrane pierced on all sides: skeleton non-siliceous, consisting of twenty spicules arranged according to J. Müller's law. 5. *Monopylea*, monozoic uninuclear Radiolarians, the capsule open on one side, and with a peculiar porous area: skeleton siliceous. 6. *Tripylea*, monozoic uninuclear Radiolarians; capsule membrane double, with one principal and two accessory openings; skeleton siliceous, formed of tubes.

As I found that the important differences in the structure of the membrane of the central capsule and the consequent passage of the pseudopodia, discovered by Hertwig in the comparatively limited material at his disposal, were corroborated in their most essential points by my researches among the wider world of the *Challenger* Radiolaria, I adopted his scheme in my "Conspectus Ordinum Radiolarium Classis," 1881 (*l.c.* p. 421), but with this difference, that I divided Hertwig's *Sphærozoea* into two orders—*Symbelaria* and *Syncollaria*. The latter, *Syncollaria*, includes the families of the *Sphæroidoida* in the wider sense, and, from the absence or incompleteness of the skeleton, corresponds as a polyzoic group to the monozoic *Thalassicollea*, whilst the former, *Symbelaria*, includes the family of the *Collosphærida* in the wider sense, and by its spherical, reticulate, siliceous skeleton corresponds as a polyzoic group to the monozoic *Peripylea*.

Recent researches, which have brought to light an immense number of new, hitherto unknown Radiolarians belonging to the last-mentioned groups, have, however, convinced me that the distinction between the monozoic (solitary) and the polyzoic (social) Radiolarians is of much less importance than was formerly supposed. They are as insignificant and of as little value in forming a system as the differences between monozoic Hydropolyps (*e.g. Hydra*, *Myriothela*) and polyzoic Hydropolyps (*Tubularia*, *Coryne*), or as the differences between solitary Infusoria (*Vorticella*, *Trichodina*) and social Infusoria (*Carchesium*, *Epistylis*). According to Hertwig, the essential difference between the two groups is that the solitary *Thalassicollea* are uninuclear, the social *Sphærozoea* (= *Symbelaria*) multinuclear. Nevertheless, the central capsule in all Radiolaria (without exception) is uninuclear at an early stage and multinuclear later on. We would require to be more exact about this distinction, inasmuch as in the *Sphærozoea* (= as in the *Acanthometrea*) the division of the simple nucleus into a number of nuclei (spore nuclei) takes place at a very early period, whilst in the *Thalassicollea* (as in the other Radiolaria) it only takes place later on. This relative modification is, however, of no standard value

[1] "Separat-Abdrück aus den Sitzungsberichten der Jenaischen Gesellschaft für Medicin. und Wissenschaft." Jahrg. 1883. Sitzung. von 16 Februar.

for the systematic distinction of the orders, and is, moreover, subject to various exceptions.

Among the new Radiolaria of the groups above mentioned discovered in the *Challenger* collection, there were, moreover, monozoic and polyzoic species which correspond completely, even in the specific characteristics of the skeletal form. For example, a monozoic *Thalassoxanthium* has precisely the same characteristic spicules as the common cosmopolitan *Sphærozoum punctatum*, but whilst in the latter the small polyzoic central capsule incloses a large central oil globule and numerous small peripheric nuclei, in the former the central capsule, which is three times as large, incloses a single, large central nucleus and numerous small peripheric oil globules. The complete identity of the characteristic skeletal form might even lead us to suppose that a kind of alternation of generation may take place between the two forms. In the same way, a social *Collosphæra* corresponds completely to a solitary *Cenosphæra*, the polyzoic *Acrosphæra* to the monozoic *Conosphæra*, and so forth.

On the ground of these observations—the importance of which I shall explain in detail in my work on the *Challenger* Radiolaria—I consider the distinction between monozoic and polyzoic Radiolarians (which I contrasted in 1862, according to Müller, as *Monocyttaria* and *Polycyttaria*) as practically unimportant, and for the present connect the polyzoic families in the system immediately with the monozoic. In this way the number of the six or seven groups is reduced to four, as I refer all the groups thus formed to Hertwig's Peripylea. As I have already shown (1881, *l.c.* p. 421), these may be again divided in pairs into two principal groups or sub-classes—into *Holotrypasta* and *Merotrypasta*. The *Holotrypasta* (*Acantharia* and *Peripylea*, the latter including the *Collodaria*, *Sphærellaria*, and *Syncollaria*) includes all Radiolaria in which the capsule membrane is pierced on all sides by fine pores, and the pseudopodia consequently radiate equally on all sides. The *Merotrypasta* (*Monopylaria* and *Phæodaria*) include all those Radiolaria in which the membrane is pierced at one side either by a single area of pores or by openings confined to a few spots, so that the pseudopodia project from the central capsule as a single bunch or as slightly separated bunches.

The high standard importance of the central capsule for the proper conception of the Radiolaria to which I first drew attention in my monograph, 1862, has since been recognised by Hertwig and most other investigators of these Protista, but recently disputed by Carl Brandt (*Monatsb. Berlin. Akad.* 1881, p. 391). As I reserve the detailed reasons for my opinion for my work on the *Challenger* Radiolaria, I shall now merely remark that my more recent researches have fully corroborated my former views, and that in all true Radiolaria the central capsule is separated by a distinct membrane from the extracapsularium (or external gelatinous soft part). The so-called "freshwater" Radiolaria (which, from absence of the membrane, are not Radiolaria but Helizoa) do not of course furnish any counter-proof. Brandt's erroneous assertion rests upon the extremely limited amount of material investigated by him. Careful investigation enabled me to discover the capsule, even in all species which he regards as "without capsule." In isolated species, however, the capsule membrane is somewhat late in forming a definite boundary between the capsule and the gelatinous sheath (sometimes just before the formation of spores), whilst in other cases it usually takes places at a very early stage. I therefore maintain now, as formerly, that the chief character of the class is the differentiation of the unicellular body into two essential, principal component parts, viz. the inner central capsule with nucleus and membrane, and the outer gelatinous sheath with matrix and forest of pseudopodia. On the other hand, it is immaterial whether "yellow cells" (or "zooxanthella") are present or not. I found them wanting in many cases, though they are usually present. I therefore agree with Cienkorosky, and regard the symbiosis of these unicellular Algæ as an accidental and not an essential phenomenon. They are in no way necessary for the nourishment of the Radiolaria, though they may be important agents in the matter.

Meantime I am convinced that the four orders of the class Radiolaria, *Acantharia*, *Spumellaria*, *Nassellaria*, and *Phæodaria* represent four distinct, perfectly natural, principal divisions. In each of these four orders the numerous forms belonging to it, despite their astonishing variety, may be referred by morphological comparison to a common primitive form, which may therefore be regarded as their ancestral form in a phylogenetic sense. This phylogenetic view of the four orders as distinct monophyletic groups is justified by the fact that the remarkable and extremely complicated relations of all the forms of each common ancestral group have the same natural, strong phylogenetic signification as they have in the comparative anatomy of the Vertebrata or of the Articulata. Bütschli was therefore in the right at the close of his admirable dissertation on the skeletons of the Cyrtida (1881, *l.c.* p. 538), where he lays stress on the fact that the complicated phylogenesis of this section, so rich in specific forms, may be regarded as an excellent argument in favour of the doctrine of descent, and that in this way those painstaking investigations of the microscopic world (which many "exact physiologists" consider mere morphological trifling) come to be of real importance.

I. The Acantharia, which are distinguished from the three other orders by their organic acanthine skeleton—they never have a true siliceous skeleton—correspond on the whole to the *Acanthometræ* of J. Müller (including, however, part of the *Haliomma*), and to the *Acanthometreæ* of Hertwig, which he divides into *Acanthometrida* and *Acanthophractida*. I hold the remarkable *Actinelius* to be the ancestral form of this order. It was first described by me in 1865, but I have lately found several forms closely allied to it, partly Astrolophida, partly Litholophida, in the *Challenger* collection. In *Actinelius* the spherical central capsule is pierced by numerous simple, radial spicules (without definite number and arrangement) meeting in the centre of the capsule. *Actinelius* may be held to have arisen immediately from *Actinosphærium* by the hardening of the firmer axial fibres in the radial pseudopodia of the latter into radial spicules. *Actinelius* is the common ancestral form, on the one hand, of the whole *Actinelidæ* (Astrolophida and Litholophida), all with indefinite number and arrangement of the spicules, and, on the other hand, of the remaining *Acantharia*, in which twenty radial spicules are invariably arranged according to J. Müller's law in five four-rayed zones. The oldest of these are the Acanthonida (or Acanthometra in the more limited sense) from which the Dorataspida and Diploconida having shells are derived later on.

II. The Spumellaria, by which I understand Hertwig's *Peripylea*, *Thalassicollea*, and *Sphærozoea*, had been previously united with tolerable accuracy by Ehrenberg, on the ground of observations made by him on the skeletons of the fossil Radiolaria of the Barbadocs, and opposed to the Nassellaria as *Polydictya* or *Polycystina composita*. His *Spyridina* (our *Spyroida*) belongs, however, to the latter, not to the former. All Spumellaria (which may also ultimately be termed Peripylaria or *Peripylea*) have—in contradistinction to the Nassellaria and Phæodaria—a central capsule pierced on all sides by fine pores, and agree in this respect with the Acantharia, from which, however, they are distinguished by the absence of the acanthine skeleton. All Spumellaria may be easily referred to a common ancestral form—to *Actissa*, the simplest form of the Thalassicollida. An interesting species belonging to *Actissa* was accurately described by Hertwig in 1870, under the name *Thalassolampe primordialis* ("Organismus," p. 32, taf. iii. fig. 5). It has neither the extracapsular alveola of *Thalassolampe* nor the intracapsular alveola of *Thalassicolla*. I observed another species of the genus, which I shall describe later in detail, as *Actissa princeps* in Ceylon, 1881. *Actissa* certainly represents the simplest possible Radiolarian form, in a measure the actual embodiment of the simplest ideal type of this whole Rhizopod class. In a phylogenetic sense it may therefore claim to be regarded as the ancestral form not only of all Spumellaria, but perhaps also of all Radiolaria. All *Collodaria* (the solitary Thalassicollida and Thalassosphærida, the social Collozoida and Sphærozoida) are derived immediately from it, then all *Sphærellaria*. The ancestral group of the latter section, which is richest of all in specific forms, is the *Sphæroida* (or *Sphærida*), and, first among them, the Monosphærida, furnished with a simple, fenestrated spherical shell. From the latter all the others, viz. Pylonida, Zygastida, Discoida, and Lithelida, can be derived without difficulty.

III. The Nassellaria, which correspond on the whole to Hertwig's Monopylea, had already been defined by Ehrenberg as *Monodycta* or *Polycystina solitaria*, in contrast to his Spumellaria. His definition was correct on the whole, though the *Spyridina* (our *Spyroida*), which he places among the latter, belong rather to the former. Hertwig was the first to determine correctly the essential characters of this large order, so wonderfully rich in forms, viz. the simple area of pores at one pole of the capsule axis, 1879 (*l.c.*), and I would therefore have retained his name, *Monopylea* or *Monopylaria*, for the entire order, had it not been equally suitable to part of the Phæodaria. I therefore prefer

Ehrenberg's older nomenclature. Like Hertwig, I regard the skeletonless *Cystidium inerme*, discovered by him (*l.c.* pp. 87, 136, taf. vii. fig. 1) as the ancestral form of the order. *Cystidium inerme* is distinguished essentially from *Actissa* by the restriction of the capsule pores to a single area, and the consequent monaxonous fundamental form of the central capsule. All other Nassellaria are derived from *Cystidium* by the development of a characteristic siliceous skeleton. Hertwig assumes that there are at least two or three entirely different original forms for the Nassellaria skeleton, viz. a simple siliceous ring (*Lithocircus*) for the Cricoid skeleton of the Acanthodesmida and Zygocystida, and a triradial siliceous framework consisting of three spicules united at one point (*Plagiacantha*) for the Plagiacanthida and Cystida (*l.c.* p. 126, &c.). I then endeavoured to refer these two fundamental forms to a single form, as I made out the combination of the simple siliceous ring and the triradial framework in many Cystida and Spyroida (or Zygocystida). In my "Prodromus" (October, 1881, *l.c.* pp. 423-444) I divided the Nassellaria order into five families, and placed the *Plectida* (with triradial siliceous framework) as the common ancestral group. From it I derived first all the *Cystida*, from these again the *Botryoida* and *Spyrida* (= Zygocystida), and from the latter the *Stephida* (= Cricoidea). At the same time, and quite independently of my researches, Bütschli was busy with the same morphological problem, and arrived at essentially the same conclusion, except that he reversed the phylogenetic series of the forms. In his admirable treatise on the skeletons of the Cystida (also dated October, 1881, published in the *Zeit. f. wissen. Zoologie*, 1882, bd. 36, p. 485) he tries to prove the morphological connection of all Nassellaria (his *Cricoidea*), but regards the *Stephida* (= *Acanthodesmida*) as the primitive ancestral form, not as the last degenerated scion, an opinion which I myself formerly shared (compare Hertwig, 1879, p. 126). Which of these two opinions is correct cannot be determined at present. Important facts favour my present view, that the triradial siliceous framework may be the common ancestral form of all Nassellaria (*Triplagia*, *Plagiacantha*). Again, other important facts favour Bütschli's view that this ancestral form may be the simple siliceous ring (*Lithocircus*, *Monostephus*). Finally, there are good grounds for supporting Hertwig's opinion, that both these ancestral forms (the triradial and the annular) may have arisen independently from the skeletonless Cystidium. I shall discuss this difficult and interesting question at length in my work on the *Challenger* Radiolaria.

IV. The Phæodaria were only known up to 1876 by three types described by me in 1862 (*Aulocantha*, *Aulosphæra*, *Cælodendrum*). By the discovery of numerous forms in the *Challenger* collection this has since acquired an importance of which we had no previous idea, as those Radiolarians far surpass all others both in size and singularity of form, as well as in peculiar combinations of structure. In my preliminary paper on the Phæodaria, 1879 (*Jena. Naturwissen. Sitzungsb.*, December 12) I distinguished 10 families with 38 genera, a number which has since been increased considerably by the continuous and astonishing discovery of new forms. As in the majority of these the skeleton is composed of hollow, siliceous tubes (differing therefore from that of all other Radiolarians), I termed the whole order *Pansolenia*, 1878 ("Protistenreich," p. 102). This name, however, suits all members of the family as little as the name *Tripylea*, proposed by Hertwig, 1879. On the other hand, the present name *Phæodaria* indicates the common characteristic of the whole order, the peculiar *phæodium*, a voluminous, dark body of pigment, lying excentrically outside the central capsule. The latter is, moreover, universally distinguished by its double membrane and by the peculiar opening furnished with a radiated operculum, which lies at the pole of the axis, and may therefore be termed the principal opening. In addition to it there are usually (though by no means invariably) two small accessory openings, lying one beside the other at the opposite (aboral) pole. Sometimes there are more than two, whilst at other times they are entirely wanting. Despite the extraordinary diversity of the peculiar, and often very complicated siliceous skeleton, all Phæodaria may likewise be derived from a common ancestral form—the skeletonless *Phæodina*.

The further phylogenetic question, whether all the hypothetic primitive forms already mentioned of the four Radiolarian orders can be referred to a single common primitive form, may now in all probability be decided in the affirmative. From *Actissa* the parent form of the Spumellaria, the ancestral form of the three other orders may be derived without difficulty. *Actinilius*, the ancestral form of the Acantharia, may have arisen from *Actissa* by the thickening of part of the radial pseudopodia into acanthine spicules. *Cystidium*, the probable ancestral form of the Nassellaria, may be derived from *Actissa* by the pores of the capsule membrane, originally developed equally and on all sides, becoming restricted to a single distinct porous area. *Phæodina*, the ancestral form of the Phæodaria may have arisen in a similar way from *Actissa* by the porous area becoming replaced by a single, simple opening, or small, additional, accessory openings, still being left, whilst at the same time the capsule membrane became double, and the pigment mass of the phæodium deposited excentrically round it. Whilst, on the one hand, the simplest Spumellaria form, *Actissa*, may be easily accepted as the ancestral form of all Radiolaria, *Actinosphærium* and *Actinophrys* show, on the other hand, how it may be derived from the simplest Rhizopoda.

(*To be continued.*)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

THE Technical Schools in connection with the University College, Nottingham, will be formally opened by Sir Frederick Bramwell on the 24th inst.

MR. J. T. DUNN, M.Sc., Demonstrator in Chemistry at the College of Science, Newcastle, and formerly Demonstrator in Physics, has been appointed Science Master and Director of the Chemical Laboratory in the High School for Boys, Gateshead. In the Gateshead High School, which opened in May 1883, there are already about 175 boys, and it is intended that all the boys shall learn Physics and Chemistry at some period of their school course.

SCIENTIFIC SERIALS

Journal of Franklin Institute, vol. cxvi. No. 696, December, 1883.—The cheapest point of cut off, by W. D. Marks. Partially based on, and in criticism of, a previous paper by Mr. Hill.—Experiments upon non-conducting coverings for steam pipes, by Prof. J. M. Ordway. In this research calorimeters are used, consisting of sheet-brass vessels so shaped that they can be clamped together outside the steam pipe, inclosing a known length of it and of its covering. Of more than fifty substances tried, simple hair-felt with a cheap cover of burlap proved best; seventeen other compositions owed their efficiency to hair. Asbestos hard pressed was a very bad material; it was non-conductive only in the downy state when full of air.—Pressure attainable by the use of the "Drop Press," by Prof. R. H. Thurston. These presses appear to be very efficient for forging hot iron.—The theory of turbines, by Prof. R. H. Thurston. This is the first part of an abstract of a most valuable mathematical discussion of the subject.—A new valve-motion, by Carl Angstrom. This is a so-called "radial" valve-motion, resembling those of Brown, Marshall, and Joy.—A simple and sensitive thermostat, by Dr. N. A. Randolph, designed for incubation and other experiments in the physiological laboratory. The adjustment is obtained by the more or less closing of the orifice for the gas by the expansion of alcohol causing mercury to rise toward the orifice.

Annalen der Physik und Chemie, xx. No. 12 (*a*), December, 1883.—On the condensation of carbonic acid on smooth surfaces of glass, by Prof. R. Bunsen. The condensation of the gas goes on for years, in spite of continual changes of density and pressure. In three years each square centimetre absorbs, at standard pressure and temperature, 5·135 cubic centimetres of the gas, about two-thirds of this amount being absorbed during the first year.—Density proportions of normal salt solutions, by C. Bender.—The law of rotational dispersion, by E. Lommel.—A simple method of investigating the thermo-, actino-, and piezo-electricity of crystals, by Prof. A. Kundt: consists in applying Lichtenberg's powder.—On the measurement of electric forces by means of the electric mill, by D. Kaempfer.—On the question whether the condensation of steam produces electrification, by S. Kalischer.—On the influence of the hardness of steel on its magnetisability, by V. Strouhal and C. Barus; also, on the influence of annealing on the retentivity of the magnet, by the same authors. These are two very elaborate and important

papers, covering the ground of many previous scattered researches. The first gives the curious result that, to obtain the highest possible degree of magnetisation, short magnets should be tempered glass hard, but long magnets should be at the other extreme of softness. The second research gives the result that the most constant magnets are those which, after fairly hard tempering, are annealed for twenty to thirty hours by heating in a steam bath, then magnetised, finally heated in steam for five hours more.—Correction, by A. Guébhard, relative to his electrochemical figures.—Use of the method of "Schlieren" for investigating intrusions in quartz, by A. Kundt.—On absolute measure, by Prof. C. Bohn.

Journal de Physique, t. ii. No. 23, November, 1883.—A. Potier, on the experiments of Wroblewski and Oltzewski on the liquefaction of oxygen, nitrogen, and carbonic oxide.—B. Elie, electrodynamic and magnetic potentials in elasticity.—A. Terquem, description of a new cathetometer of M. Dumoulin Froment. This cathetometer is divided into two parts—a vertical standard scale mounted on three levelling feet, to be set up near the apparatus, and a levelled observing telescope sliding upon another vertical stem to be set up at a distance, this second part of the apparatus being just an ordinary cathetometer without a scale.—Bichat and Blondlot, influence of pressure on the electric difference between a liquid and a metal in contact.—Krouchkoll, on immersion currents and on those due to the movement of a metal in a liquid, and on currents of emersion.—E. H. Hall, abstracts (by M. Leduc) of papers on so-called rotational coefficient.—Aug. Righi, on Hall's phenomenon. Righi finds this phenomenon to be 5000 times as strong in bismuth as in gold. The process by which his film of bismuth, only 0·079 mm. in thickness, was procured is not stated.—H. Rolti, on Hall's phenomenon in liquids.—H. Koch, on magneto-electric rotations.

Bulletins de la Société d'Anthropologie de Paris, tome vi. fasc. 3, Paris, 1883, contain:—A paper by M. Hamy, on the interpretation of an inscription on the Mexican stone tablet in the Museum of the Trocadéro, supposed by him to refer to the foundation, in 1483, of the temple of the great Aztec divinity, Hiutzilopochtli.—On the special frequency in criminals and in the insane of an anomalous medial occipital fossa, by Prof. Lombroso.—On the significance of the interlaced hearts common in the ornamentation of rings, crosses, &c., in use in La Bretagne and La Vendée, by M. Bonnemère, who regards them as of mediæval origin, and connected with marriage, while Madame Clémence Royer showed that they were of modern design, and religious in character, representing the hearts of Jesus and the Virgin, as symbolised in the convents of the Sacré Cœur.—A communication from Madame Clémence Royer, setting forth her claim to be regarded as the first person who pointed out that Lamarck was the true father of the theory of evolution, she having expounded his doctrines in a course of lectures on philosophy given by her in 1859-60.—On the explorations of the Grotto des Cottés in Poitou, by M. de Rochebrune. The finds exhibit fossil bones in great abundance, well-cut flints, and a human skeleton, which has been submitted to M. de Mortillet.—On the Chelléan deposits of Ternifine, in Algiers, by M. le Dr. Tommasini. These contain remains of so-called *Elephas atlanticus*.—On Prof. Putnam's recent explorations of Kjökkenmöddings, mounds, ash-pits, and stone-graves in Maine, Ohio, and Tennessee, by M. de Nadaillac.—On a more correct mode of classifying the colour of the eyes and hair in reference to the determination of ethnic characteristics, by M. Ikow.—On the "Er Fousen," or pit-graves in St. Pierre-Quiberon, in La Bretagne, by M. Gaillard.—On the anthropomrtric determination of the principal races of France, by M. le Dr. Collignon. A detailed and exhaustive treatise, in which the author, after setting apart a distinct group of Frenchmen, considers the rest of the French nation, somewhat arbitrarily, under four heads—Celts, Cimri, "Lorrainians," and so-called "Mediterranéens." Under the latter term he treats of those south-western races of France, whose chief source of origin is the Eastern Pyrenees, and who designate themselves as Catalans.—On the craniometric study of plagiocephalics, by M. le Dr. Manouvrier, bearing on the question af cerebral asymetry as a characteristic of superior brain-capacity.—On anomalous muscles in man, by M. le Dr. Testut.—Note on the various objects of fetish from Upper Ogooe, by M. Delisle. In the discussion to which the communication gave rise, M. de Mortillet maintained the view, to which he has frequently given expression, that in Africa originated the use of iron for industrial purposes, while the African was the only savage who knew how to extract and work the metal. In the iron projectile arms from the Congo M. de Mortillet believes we have analogous weapons to those seen in the hands of the Assyrian kings when represented as engaged in lion-hunting.—On the decrease of the population in France, by M. Lagneau. This decrease was known to amount to seven for every hundred inhabitants in twenty-six Departments, although there were only eight of these in which the deaths exceeded the births.—On the "Questionnaire de Sociologie et d'Ethnographie" of the Society, drawn up by MM. Hay, Hovelacque, and Vinson, and submitted by them to their *confrères*.—On two crania found in the Department de la Drôme, by M. le Dr. Delisle. One of these is dolichocephalic, and similar to the Cro-Magnon type; the other is brachiocephalic.—On the dangers of premature exercise of the higher intellectual faculties and of the physical powers in relation to the present excessive academic requirements and early term of military service in France, by M. Dally.—On M. Testut's elaborate prehistoric chart of La Dordogne, by M. Hamy.—On the practices and superstitions which prevail in Artois and Picardy in connection with bees, by M. E. T. Hamy. Such practices in no way differ from those described in the "Georgics," excepting in as far as concerns the aspersion of the hive with holy water by the modern peasant bee-cultivator. In Artois, as in Berry, when the master of the house dies his hives must be covered with black, and the fact of his decease whispered to the bees to avert their otherwise inevitable death.—On some cephalometric determinations on the living subject in Greece, by M. Apostolides. He considers that the people of the Peloponnesus have best preserved the dolichocephalic type of the ancient Greeks, as shown in the crania of tombs belonging to the fourth century B.C.—The first part of a paper by M. de Ujfalvy on the "Kafirs-Siapochs," or "Black-roted" tribe of the Hindoo-Koosh.

Archives of the Physical and Natural Sciences, Geneva, Nov. 15, 1883.—Researches on the absorption of the ultra-violet rays by aqueous and vitreous humours, albuminoids, and other substances, by M. J. L. Soret.—On electrolytic condensers, by Dr. C. E. Guillaume.—Sixty-sixth session of the Helvetic Society of Natural Sciences held at Zurich in August, 1883: Report on the Geological Session, president, Prof. Suess of Vienna. Papers were read on the structure of the Alps, by the President, who rejected the theory of upheaval, denying the existence of any natural motive power capable of raising lofty mountain ranges; on the old glaciers of the northern slopes of the Alps, by M. Alph. Favre; on the climateric zones during the Jurassic and Chalk epochs, by Prof. Neumayr of Vienna; on the Kimmeridge formations of the Vaude Alps, by M. Schardt of Montreux; on the fossils of the same geological area, by M. de Loriol; on the physical and chemical changes undergone by rocks subject to glacial pressure, by Prof. Mühlberg of Aarau; on some specimens of spath fluor recently found in the dolomitic limestones of Trolerengraben, Valais, by M. Ed. de Fellenberg; on the hydrographic system of the Jura range in the canton of Neuchâtel, by M. Jaccard; on the mollasse and glacial formations of Upper Suabia, by M. Probst of Essendorff; on the gypsum formations of Vorarlberg, by M. Chavannes; on a sectional profile of the Schlossberg in the Titlis range, showing the geological dispositions of the limestone rocks of the twelfth sheet in Dufour's map, by Dr. C. Moesch of Zurich; on the fauna of the coal and limestone formations in the Permian system of Bohemia, by Dr. A. Fritsch; on an ancient post-Glacial lacustrine basin in the Soleure district, formed by three concentric frontal moraines, slight traces of which still survive in the Aar valley, by M. Alph. Favre; on the earthquake at Ischia, by Prof. Suess.

Nachrichten of the Royal Society of Sciences and of the University of Göttingen, July 30, 1883.—On some historical documents connected with the history of Bavaria during the fourteenth century, by Ludwig Weiland.—Remarks on Jacobi's theory of elliptical functions, with special reference to his logarithm of theta functions (continued), by A. Enneper.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, December 20, 1883.—"Note on the Constitution of Chlorophyll." By Edward Schunck, F.R.S.

The author having for some time been engaged in examining the derivatives of chlorophyll, the question of the constitution of

that body presented itself. Whatever chlorophyll may be from a physiological point of view, for the chemist it is simply an organic colouring matter. The colouring matters occurring naturally in the organs of plants and animals are of several kinds. The greater number belong to the class of so-called glucosides, *i.e.* bodies which by decomposition with acids or ferments yield some kind of glucose or sugar as one of the products. The author was led to suspect that chlorophyll might turn out to be a glucoside, its general properties being such as characterise that class of compounds. To prove this by direct experiment was almost impossible, on account of the difficulty in preparing chlorophyll in a state of purity; but the author describes some experiments made with solutions of chlorophyll, which tend to show that when decomposed with acids it does behave as a glucoside, splitting up into glucose and other bodies, the phyllocyanin and phylloxanthin of Fremy being products that are formed at the same time.

Mathematical Society, January 10.—S. Roberts, F.R.S., vice-president, in the chair.—Messrs. D. Brockelbank and Asutosh Mukhopadhyay were elected members, and Messrs. Fortey and Heppel admitted into the Society.—The Chairman spoke upon the late Mr. C. W. Merrifield's mathematical work and upon his services to the Society, and concluded his remarks by reading the words of a vote of condolence with the family of the deceased which the Council had requested the President to communicate to them.—Mr. A. Buchheim stated an extension of Pascal's theorem to space of three dimensions, and communicated a paper on the theory of screws in elliptic space. His special object was to show that Grassmann's "Ausdehnungslehre" supplies all the necessary materials for a calculus of screws in elliptic space, and that Clifford was apparently led to construct his theory of biquaternions by the want of such a calculus.—Mr. H. Fortey read a paper on contacts and isolations, a problem in permutations.—Mr. Tucker presented a paper by Prof. H. Lamb on the induction of electric currents in cylindrical and spherical conductors, and spoke on a group of circles which are connected with the "triplicate-ratio" circle.

EDINBURGH

Royal Physical Society, December 19, 1883.—Dr. R. H. Traquair, F.R.S., president, in the chair.—The following office-bearers were elected for the year 1883-84, viz. Presidents, Dr. R. H. Traquair, F.R.S., B. N. Peach, F.R.S.E., F.G.S., J. A. Harvie-Brown, F.R.S.E., F.Z.S.; Secretary, Robert Gray, V.P.R.S.E.; Assistant Secretary, John Gibson; Treasurer, Charles Prentice, C.A., F.R.S.E.; Librarian, J. T. Gray, M.A.—The following papers were read, viz.:—Notes on the genus Gyracanthus, by Dr. H. Traquair, F.R.S.—On a specimen of Pecopteris in circinate vernation with remarks on the genera Spiropteris and Rhizomopteris of Schimper, by Robert Kidston, F.G.S.—On a new species of Schutzia from the calciferous sandstones of Scotland, by R. Kidston, F.G.S.—On the structure of Sarcodictyon, by Prof. W. A. Herdman, F.R.S.E.—Notes on the islands of Sula Sgeir or North Barra and North Rona, with a list of the birds inhabiting them, by Mr. John Swinburne. Specimens of eggs from the islands were also exhibited.—Mr. J. A. Harvie Brown, F.Z.S., exhibited, with remarks, a specimen of the Little Gull (*Larus minutus*), shot in the island of North Uist.—Mr. Hoyle exhibited, with remarks, a skeleton of the extinct Moa (*Dinornis diliformis*).—Dr. Traquair exhibited a specimen of the Osprey (*Pandion haliaetus*), shot in Midlothian.—Prof. Arch. Geikie, F.R.S., was elected an honorary Fellow of the Society.

Mathematical Society, January 11.—Mr. Thomas Muir, F.R.S.E., president, in the chair.—Prof. Chrystal delivered an address on surfaces of the second order, in which he advocated strongly the study of the properties of these surfaces from the surfaces themselves. The address was illustrated by a large number of beautiful models in wood, plaster, cardboard, and thread.—Prof. Tait communicated an analytical note, and one or two geometrical problems were discussed.

DUBLIN

Royal Society, December 17, 1883.—Rev. Dr. S. Haughton, F.R.S., in the chair.—On the Ringhals or Cape Cobra, by M. G. R. O'Reilly. The author briefly describes some of the habits of this snake (*Sepedon hæmachates*), called "ipimpi" by the Kafirs. He is peculiarly subject to fear, but, when compelled, fights savagely. Raising one-third of his length perpendicularly, and with expanded hood, he advances, dashing his head repeatedly to the ground and hissing furiously. Should he come close enough, he strikes repeatedly, not open-mouthed, but only with the point of the fangs that protrude lightly downwards over the lower lip. But little poison is introduced into the superficial wound produced in this way, and such wounds are not nearly so often fatal as those produced by the puff-adder. There is, however, a time when the Ringhals is much more to be dreaded. When driven to an extremity, he sometimes subsides into a kind of swoon, and lies as if dead with his mouth somewhat gaping, but woe to the man who should curiously venture his finger therein; it would be instantly locked as in a vice, the fangs would be buried in the flesh, and the poison would flow unceasingly. He will not let go, but, like a bulldog, will allow himself to be beaten to death rather than relinquish his hold. When he finds fatigue coming on, he exerts himself to hold the faster, and each new exertion causes the deadly venom to flow more and more. By degrees fatigue overcomes him, and inch by inch, from the tail upwards, his muscles lose their rigidity, till at last after perhaps a quarter of an hour, finding himself unable to hold on any longer, he lets go. Then if again attacked he fights anew, apparently as fresh as ever; but if allowed a little peace he will lie still a few moments, and then calmly glide away to feast again on the frogs in the sedges, or sun himself once more by the heated rocks on the hillside.—On more convenient equivalents for converting British into metrical measures than those hitherto in use, by G. Johnstone Stoney, D.Sc., F.R.S. Capt. Clarke's determination of the length of the British yard in metrical measure, made at Southampton in 1866 for the Ordnance Survey (see *Philosophical Transactions* for 1867), differs by a small amount from that which had previously been made by Capt. Kater, and it is noteworthy that the small difference between these excessively careful determinations is greater than the difference between Capt. Clarke's determination and the very simple equivalent,

The yard = 914·4 millimetres;

so that the outstanding error which will be incurred if this very convenient number is adopted is of an amount which is inappreciable in ordinary good scientific work. It is less than the expansion produced in iron standards of length by one degree of temperature. Again, the pound avoirdupois differs, according to Prof. Miller's determination (which is the most elaborate we possess), from the simple equivalent,

The pound = 453·6 grammes,

by only one-quarter of a grain avoirdupois in a kilogramme. This is about 1/70 of the correction which would have to be made in weighing water in order to reduce its apparent weight to its weight in vacuo, and is of small account even in carefully conducted scientific work. The value of the gallon, which follows from Capt. Clarke's determination of the metre, is 1·000027 times that adopted in Dowling's Metrical Tables, and differs from the simple equivalent,

The gallon = 4544 cubic centimetres,

by an amount which is less than a cubic centimetre in ten litres, an error which is inappreciable; measures of capacity not admitting of being compared so closely as weights and measures of length. Hence we may take as our fundamental units—

The yard = 914·4 millimetres,

with an error of less than a fifth-metret[1] in the metre, on the authority of Capt. Clarke;

The pound = 453·6 grammes,

with an error of one-quarter of a grain avoirdupois in a kilogramme, on the authority of Prof. Miller;

The gallon = 4544 cubic centimetres,

with an error of less than one cubic centimetre in ten litres, on the authority of the best previous determinations corrected by Capt. Clarke's. It is a truly remarkable circumstance that the first of these numbers happens to be divisible by 3^2 and 2^3, the second by 2^3 and 7, and the third by 2^6. Divisors more convenient could hardly have been chosen for dealing with the disorderly way in which British measures are subdivided. They furnish the following tables, which may be safely recommended:—

[1] By metrets are to be understood decimal subdivisions of the metre. The fifth-metret is the fifth of these, or the hundred-thousandth of a metre. It is about the diameter of one of the red disks in human blood.

TABLE I.—*Measures of Length.*

The yard	= 914·4	millimetres.
The foot	= 304·8	,,
The inch	= 25·4	,,

TABLE II.—*Weights.*

The pound	= 453·6	grammes.
The half-pound	= 226·8	,,
The quarter pound	= 113·4	,,
The ounce	= 28·35	,,
The grain	= ·0648	,,

[This last gives the gramme = 15·43210 grains, a number which it is singularly easy to recollect.]

TABLE III.—*Measures of Capacity*

The gallon	= 4544	cubic centimetres.
The quart	= 1136	,,
The pint	= 568	,,
The half pint	= 284	,,
The noggin	= 142	,,
The fluid ounce	= 28·4	,,

If any person using these tables wishes to carry refinement farther, he may do so by subtracting one in every hundred thousand after using Table I., by subtracting one in sixty thousand after using Table II., and by subtracting one in ten thousand after using Table III. These corrections will carry accuracy to the limit of Prof. Miller's and Capt. Clarke's determinations.—R. J. Moss, F.C.S., showed an experiment illustrating the use of Rohrbach's heavy liquid—a solution of baric and mercuric iodides. Minute garnets occurring in Dublin granite were separated from the roughly pulverised rock in a state of purity, and in quantity quite sufficient for an exhaustive analysis.

SYDNEY

Linnean Society of New South Wales, October 31, 1883.—The President, C. S. Wilkinson, F.G.S., in the chair.—The following papers were read:—Occasional notes on plants indigenous in the immediate neighbourhood of Sydney, No. 5, by Edward Haviland.—Notes on the temperature of the body of the *Echidna hystrix*, by N. de Miklouho Maclay. This is a detailed account of some experiments made by the writer at Brisbane in July, 1879. He found, after observations carefully made on two occasions, that the average temperature of the body of the Echidna is 25° C., equal to 78° F., or very little more than that of fish, and about 25° under that of mammals generally.—On the Plagiostomata of the Pacific, part ii., by N. de Miklouho Maclay and William Macleay, F.L.S. The continuation of a paper by the same authors, written some years back, on the genus Heterodontus. The present paper gives descriptions and illustrations of a new species from Japan, named *Heterodontus japonicus*.—Notes on some reptiles from the Herbert River, Queensland, by William Macleay, F.L.S. In this paper, after enumerating all the Reptilia contained in the collection sent to him by Mr. Boyd from the Herbert River, Mr. Macleay describes as new a lizard, *Tiaris boydii*, and three snakes, *Tropidonotus angusticeps*, *Dendrophis bilorealis*, and *Herbertophis plumbeus*, the latter a new genus allied to Coronella.—Notes on some customs of the aboriginal tribes of the Albert District, New South Wales, by C. S. Wilkinson, F.G.S., president. The President read some notes furnished him by Mr. W. H. J. Slee, the Government Inspector of Mines, regarding a singular ceremony which the aboriginal tribes of the Mount Poole district perform, when, as is often the case in that arid region, they need rain. Occasionally pieces of the fibrous variety of gypsum, Satin-spar, are found by the natives, who highly value them and call them "rain-stones," for they believe that the Great Spirit uses them in producing rain. The President exhibited one of the "rain-stones" which had been secured by Mr. Slee, who witnessed the ceremony when performed two years ago by the Mount Poole and Mokley tribes.—On the brain of Grey's whale (*Kogia greyi*), by William A. Haswell, M.A.—On a new genus of fishes from Port Jackson, by Wm. Macleay, F.L.S. This paper consists of the description of a large fish taken a few days ago in a seine net at Watson's Bay. It is of the family *Cirrhitidæ*, and somewhat allied to the genus *Chilodactylus*. The generic name given to it is *Psilocranium*, from its naked head, and the specific name *Coxii*, in honour of the President of the Commissioners for Fisheries of New South Wales. This fish was exhibited by Mr. Morton, Assistant Curator, Australian Museum.

Royal Society of New South Wales, October 3, 1883.—Hon. Prof. Smith, C.M.G., president, in the chair.—Two new members were elected and thirty-five donations received.—A paper by H. Ling Roth, F.M.S., on the roots of the sugar-cane, was read.—Mr. H. C. Russell exhibited a modification of Faure's bichromate battery.—Mr. Russell exhibited several new photographs of the sun taken by him at the Sydney Observatory.

November 7, 1883.—H. C. Russell, F.R.A.S., in the chair.—One new member was elected and eighty-eight donations received.—A paper, on irrigation in Upper India, was read by H. G. McKinney, M.E.—Prof. Liversidge exhibited portions of a fossil crocodile from the Flinders River in Queensland, and other fossils.

November 14, 1883.—Hon. Prof. Smith, C.M.G., president, in the chair.—An adjourned meeting was held, and a paper, by Mr. A. Pepys Wood, on tanks and wells of New South Wales water supply and irrigation, was communicated by Mr. Warren, C.E.

PARIS

Academy of Sciences, January 7.—M. Rolland, president, in the chair.—M. Bouley was elected vice-president, and MM. H. Milne Edwards and Becquerel added to the Central Committee of Management for the year 1884.—The President reported on the papers, memoirs, and documents of all kinds issued by the Academy and received from various sources during the year 1883. The changes that took place amongst the members and correspondents during the same year were announced.—Report on the hydrographic explorations of the *Romanche* in Tierra del Fuego, by M. F. Martial. The work accomplished comprised three distinct parts—(1) the regular triangulation of a portion of Beagle Passage and of several islands, besides twenty plans of various roadsteads; (2) the survey of the north-western branch and about half of the south-western branch of Beagle Passage and the Ildefonsus Islands; (3) exploration of the north-west extremity of Talbot Passage, of the west side of the archipelago from Cook Bay to Black Head Cape, and of the various channels connecting Brecknock Passage with Whaleboat and Darwin Sounds.—Report on the climate of Cape Horn, by M. J. Lephay. Appended to the report are various meteorological tables showing the temperature, barometric pressure, atmospheric currents, direction and velocity of the winds observed at the station of Orange Bay from September 26, 1882, to August 31, 1883.—On the spectrum of the Pons-Brooks comet, by M. Ch. Trépied.—Spectroscopic observations made at Nice on the Pons-Brooks comet, by M. Thollon.—Observations at Marseilles on the same comet (one illustration), by M. E. L. Trouvelot.—On certain doubly periodical functions of the second species, by M. E. Goursat.—On the application of Vandermonde's notation to the representation of hypergeometrical polynomes in a condensed form, by M. Radau.—Calculus of the contact arc of a flexible, spiral, metallic rod, according to any given conditions, on a circular cylinder, by M. H. Léauté.—Note on the action exercised on polarised light by the cellulose solutions in the Schweizer reagent, by M. A. Levallois.—On the compound heat of the soluble fluorides and the law of substituted thermic constants, by M. D. Tommasi.—Some new sulphuretted salts derived from the trisulphuret of phoshorus, by M. G. Lemoine.—On the law of free surfaces in vegetable anatomy, by M. C. Eg. Bertrand.—On the modifications presented by the muscles after severance of the nerves communicating with them, by M. J. Babinski.—On progressive atrophic myopathy (hereditary myopathy beginning in infancy with the muscles of the face, without change in the nervous system), by MM. L. Landouzy and J. Dejerine.—Researches on some recent pretended infallible specifics against hydrophobia (second note), by M. P. Gibier. Garlic and pilocarpine (active principles of jaborandi), tested on rats and cats, were found to be powerless to prevent the development of rabies.—Note accompanying the photographs of natural size of two children delivered by the operation of paratomy in cases of extra-uterine pregnancy by M. Championnière, of the Tenon Hospital, by M. Just Lucas Championnière.—Observations on the remarkable sunsets and dawns observed at Campan during the month of December, 1883, by M. Soucaze. No solution of the phenomenon is offered; but to the volcanic theory it is objected that the effects should be permanent if due to the permanent presence of minute igneous particles in the atmosphere.

BERLIN

Physical Society, December 14, 1883.—Prof. Börnstein described an apparatus for measuring the momentum of

the wind, constructed and set up by him in the High School of Agriculture. Hitherto, as is well known, in order to compute the momentum of the wind, people had either registered its velocity by means of the Robinson anemometrical scale, or its pressure by means of the so-called pressure table. The cross-cup instrument laboured, however, under this disadvantage, that it was incapable of following a rapid change of the wind's velocity, being neither able, under an increase of velocity, to pass at once to the duly accelerated pace, nor in the case of an abrupt abatement of the wind's speed, to fall back, till after a considerable time, to the commensurately slower rate. The pressure-table, again, was attended with this disadvantage, that on each occasion it had to be placed in the direction of the wind, and in the case of a relief of pressure, performed oscillations of its own, which registered themselves on the writing apparatus. Prof. Börnstein's instrument consisted essentially of a ball, 126 mm. diameter, affixed to a vertical descending rod, which by an axle-system, at four-fifths of its length, was rendered freely movable on all sides. To the lower end of the rod was fastened a long wire, likewise movable on all sides, and suspended inside a tube 4 metres long. At a still greater distance was placed a quadrilateral vertical prism, movable between rollers, so that each lateral movement of the ball became converted into an up and down movement of the prism. To the prism there hung a frame with a pencil, which marked in curves on a passing strip of paper the movements produced by the pressure of the wind on the ball. At the lower end, again, there was fixed a horizontal plate, by way of a damper. Several of the curves described by this measurer of wind-pressure were shown by Prof. Börnstein, among others that of December 4, a day distinguished by a very low minimum (730 mm.), which passed over Europe from west to east. The observer perceives in this curve a very great rise of the wind's momentum during the day, then at about seven to nine in the evening he sees the curve descend almost to the line of zero, remounting thence in the later hours of the night to its maximum. This showed that the centre of the barometric minimum had passed exactly over Berlin, two periods of intense wind-momentum being separated by a lull of considerable duration.—Dr. König added some supplementary notes to the address recently delivered by him before the Society, setting forth the results of his investigations into the state of the colour-blind (see NATURE, vol. xxix. p. 168). Among other things he read a passage in Goethe's "Theory of Colours," showing that Goethe had already examined a colour-blind person, regarding whom he was of opinion that he was blue-blind, or *akyanoblept*. From Goethe's statements, however, it was plain that the individual in question was red-blind, and it would accordingly appear that this was the first real observation of a case of colour-blindness.

Physiological Society, December 21, 1883.—Prof. Fritsch gave a demonstration of the model of a brain, prepared according to the directions of Prof. Aeby in Zurich, and acquired by the Physiological Institute. By means of differently coloured wires and of coloured balls of different sizes, it shows the situation of the cerebral ganglia, and the course of the nerve-fibres in connection with them. The nerve-cords and the ganglia pertaining to them are without exception of the same colour. The connections between the spine and the separate sections of the cerebrum and cerebellum, the cerebral cavities and fissures, come out very clearly in the skilfully fashioned model.—Dr. Falk spoke of the transference from mother to fœtus of corpuscular and chemical poisons, and brought prominently to notice the different results yielded by observations on man and experiments made on animals with a view to obtaining knowledge on this subject. Infectious diseases, such as small-pox, syphilis, &c., were conveyed from the mother. Other diseases, such as inflammation of the spleen, were not so conveyed. With respect to chemical poisons, the case was likewise various. The statements of different authors respecting the oxide of carbon did not agree. Dr. Falk had quite recently had occasion to dissect a woman who died from the poison of oxide of carbon. Her body displayed all the symptoms characterising this form of death, showing in a singularly perfect manner the bright colour of the skin, of the muscles, and of the blood. The dead fœtus of the deceased woman, which was of eight months' growth, had, on the other hand, normally coloured muscles and dark blood, in which neither chemical reagents nor spectral analysis discovered a trace of the oxide of carbon. A case having, however, been elsewhere observed of the passage of the oxide of carbon into the blood of a fœtus six months old, Dr. Falk conjectured that the age of the embryo, more particularly the greater or less thickness of the partition dividing the mother's system of blood-vessels from that of the child, formed a considerable item in the account. This point he would study by experiments on the osmosis of gases.—Dr. Blaschko communicated the results of his investigations into the structure and embryological development of the outer skin in the palm of the hand of man and apes. On the under side of the epidermis he not only found protuberances corresponding with the regular furrows visible on the surface, but, answering to the prominences of the surface, were also found protuberances on the under side connected with the former by transverse swellings. The study of the histological development of the outer skin further taught Dr. Blaschko that the epidermis, with its protuberances and depressions, was first fully formed before the cutis came into shape, attaching itself to the epidermis.—Dr. Salomon has endeavoured to fill a gap which was yet perceptible in our knowledge of the urine of domestic mammalia. In particular there existed but four analyses of the urine of the pig, which, as an omnivorous animal, stood specially near to man, and of these four, three were of earlier date than 1845. These four analyses, moreover, all concurred in denying that the urine of swine contained any uric acid, a circumstance very remarkable in face of the fact of the universal diffusion of this substance among all the other higher animals that had yet been examined. Its place was supposed to be supplied in the pig by guanine. As the result of his examinations, Dr. Salomon found that in all cases the urine of swine contained uric acid, and that in no inconsiderable quantities. The proportion of uric acid in the urine was, in swine, as 1 to 150; in man, 1 to 50. Guanine, on the other hand, could not be indisputably proved to be present in the urine of swine; but a crystalline substance, very closely related to guanine, and showing similar reactions, was found; lactic acid, the presence of which in swine had been maintained, could not be discovered, although succinic acid, which comes near to it, was found. Creatine and creatinine, as also other xanthine substances, were likewise searched for in the urine of swine.—In connection with this subject, Dr. A. Baginski stated that in the urine of a diptheritic child suffering from nephritis he had found a substance very nearly related to guanine, as also xanthine, both in perfectly perceptible quantities. Both these substances, however, decreased in quantity with the abatement of the disease.

CONTENTS

ss thick-
d-vessels
account.
nosis of
nvestiga-
the outer
e under
s corre-
ce, but,
o found
rmer by
elopment
idermis,
formed
epider-
ich was
omestic
s of the
, stood
f earlier
oncurred
ac'd, a
niversal
animals
ed to be
examina-
of swine
e quan-
n swine,
er hand,
urine of
guanine,
the pre-
not be
o it, was
ne sub-
ine.—In
t in the
nd found
ne, both
es, how-
isease.